

RAIL BUS FEASIBILITY
A Preliminary Evaluation
of a
Proposed Railbus Demonstration Project
Part I of II

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EXECUTIVE SUMMARY

- The purpose of the study is to review the railbus concept as a means of providing remote communities with reasonable access to shopping, medical, and administrative centres in the north.
- There is a continuing daily need for access to shopping, medical and administrative centres which can be served on a day to day basis complementing, but not replacing, conventional rail services.
- The service would be used not only by community residents, but also by such agencies as the Department of Indian Affairs, Northern Affairs, Health Services, Frontier School Division, RCMP and the Judiciary.
- An ideal location to undertake a demonstration project is between Thicket Portage-Thompson-Pikwitonei. The track is good, with limited traffic, free of road crossings and automatic signaling devices. The greatest distance from Thompson where emergency assistance is available from INCO, is no more than 45 miles or 1 1/2 hours away.
- Once the capability of the vehicle and its reliability has been proven, it should be tested on a linear run to Ilford and Gillam following that, and between The Pas, Flin Flon, Sherridon, Pukatawagan and Lynn Lake to prove its reliability for use elsewhere in remote areas of Canada.

- Trains, which are guided by rails, require less power than highway vehicles due to lower rolling resistance. Consequently, trains can be longer than highway units but this requires that trains be of a heavier construction than is required by a single unit such as a bus in order to protect passengers, cargo and equipment.
- Minimal changes would be required to the highway type bus to ensure that the railbus vehicle can be serviced in the north rather than having to be taken hundreds of miles to major specialty rail shops.
- Railbus operating experience in Manitoba over the past 60 years by Winnipeg Hydro and The Greater Winnipeg Water District Railway indicate a need for minimal design changes.
- The most expensive unit considered was a new Motor Coach Industries MC9 highways bus which, when adapted for use on rail, would cost less than \$300,000 compared with the cost of more than a \$1 million Rail Diesel car.
- The cost for the complete railbus demonstration project over the three years is estimated to be \$1,170,000 for capital costs which include 3 buses, equipment, building and monitoring and \$270,000 for operating costs plus any charges by CN for use of their facilities.

Introduction

The intent of this study is not to produce detailed specifications of a railbus. But rather to:

1. Evaluate the need and possible use of such a service to a low density rail-dependent area.
2. Determine the possible size and specialty features of the potential equipment suggested for such service.
3. Develop the order of magnitude costs of testing such a service and equipment.
4. Suggest some possible variations that could be tested.
5. Suggest some possible operating and staffing parameters.
6. Suggest an operating and monitoring organization for a possible test project.
7. Collect knowledge easily available to evaluate the chances of the project's social and financial success.
8. Determine the possibility of local servicing and maintenance of equipment.

It is hoped that this study will be accepted not as a criticism of the traditional railroad trains or systems which certainly have their place and need in most areas and situations. Rather, what is proposed is a modern complimentary rail addition intended to maintain a tradition whereby the railroads developed and helped to unify this country. The development of the railbus may be a pioneer service to the rail-captive north akin to the service concept delivered to the early West.

This evaluation of a concept suggests some of the alternatives to be considered in determining the scope and funds required. The paper first looks at the evolution of the need for such a service and the selection of a test area. By reviewing the community needs and railbus concepts some possible railbus specifications are suggested. A demonstration project organization structure and staffing needs are then looked at, as are railbus maintenance requirements. This is followed by a brief examination of the probable costs and revenue ranges during the first year of operation along with some running rights criteria. The report concludes by suggesting some of the research possibilities and recommendations.

In short, rather than looking at the equipment available and trying to make it fit the area, an attempt is being made to look at the market and suggest the equipment required. In an effort to determine the first years operating costs, highway bus costs have been used. These generally overstate what is expected of a rail operation and should be considered as the worst case.

Rail Bus Evaluation

Background

Through the years all modes of transportation have specialized and produced new volume efficiencies to meet the demands of population growth areas. "Bigger is better", has been the theme as evidenced by the changes from the 8 passenger Beechcraft to the 490 passenger 747, or the half ton truck to the 135,000 gvw and bigger rigs. The savings realized in growth centers have been significant. However, the result to small communities has been devastating. A small hamlet of 200 will never generate the volume to warrant the 747. The aircraft industry, recognizing this, has provided alternatives such as the Twin Otter. However, with a few exceptions in Europe, railroads have not set out to provide alternate passenger rail service. Today, no rail equipment is available to assist a small or new rail-dependent community to survive or grow. This study is an attempt to determine the needs of one such area, and to develop some order of magnitude costs of one possible rail alternative, "the railbus".

Prior to any detailed study a test area must be selected. The criteria for the selection of a test area was established and 2 northern Manitoba areas were looked at as potentials. The following were considered as test area requirements during the early test stage.

1. Minimum of variables or problems i.e. no level crossings, no automatic signals, ABS (Automatic Block System) or CTC (Centralized Traffic Control) territory.

2. Short distance of travel (under 50 miles) which allows for schedule flexibility, quick rescue in event of cold weather break down and ease of monitoring.
3. More than one isolated community in the test area for acceptance comparisons of equal service.
4. A large base center where the automotive maintenance skills are available.
5. Possible linear expansion of the test to other isolated communities, 100 to 200 miles distant from the base; once initial equipment corrections have been made.
6. Desire and need of the test communities to travel to base community and to be part of the demonstration project.

The two areas that were examined for a demonstration project were the Flin Flon or The Pas-Pukatawagan-Lynn Lake, and The Bay Line north of The Pas. Both areas have small rail-dependent communities. Level road crossings exist between The Pas and Cranberry Portage.

The Sheridan subdivision north of Cranberry Portage is free of level crossings (except at Flin Flon) as is the area north of Wabowden. Neither area is CTC or ABS territory. Rail traffic moves on manual train orders.

The area selected as the best for test purposes was Thicket Portage-Thompson-Pikwitonei for the following reasons:

1. The distance from Thompson to either community is approximately 45 miles. In case of break down no point is more than one and one half hours from help. Trying new equipment on a 200 mile run in 40° below appears less desirable.
2. Thompson, Flin Flon or The Pas as service centers could provide the maintenance expertise, not available in smaller communities. Thompson has the advantage of twice daily air service from Winnipeg insuring parts availability.
3. From the Thompson base the service could be expanded to Ilford and Gillam, once equipment has been proven and problems have been identified and corrected. This option is not possible in Lynn Lake-Pukatawagan area.
4. Thicket Portage, having lost three weekly trains, will not be getting a new additional service, but rather an improvement to the service it lost last year.
5. This area has been working on this concept for two years, and the communities perception is positive.
6. A passenger backhaul¹ situation exists between Thompson and the remote communities of Thicket Portage, Pikwatonei and Ilford. This is not true of Flin Flon as indicated in the chart III Appendix I.

1. Backhaul: refers to the direction of light loading.

7. Although Pukatawagan is a larger community, which will probably require service eventually to Lynn Lake, The Pas and Flin Flon, initially the residents are split as to which should come first. If they wish to bus to Winnipeg they want to go to The Pas not Flin Flon. The larger populations of Pukatawagan and Sheridan require large back-up equipment in case of break-down escalating the initial capital and operating costs.

It is therefore suggested that the following sequence be followed in the development of the Railbus Demonstration Project.

1. Using Thompson as the base, start a limited service to both Thicket Portage and Pikwitonei.
2. During this initial period examine problems with adequate monitoring personnel. After 3 to 6 months of data collection the improvements suggested by the data should be engineered into the railbus vehicle.
3. With this improved vehicle, expand the service to Thicket Portage and Pikwitonei as volume dictates, and start a limited service to Ilford and Gillam where a distance run can be tested.
4. When item 3 has been tested and proven and additional modifications as required are made to the unit, service in this area should be upgraded to the demand with additional equipment if required. Also, after a marketing study is done in The Pas, Flin Flon, Sherridon, Pukatawagan, Lynn Lake area it should be included in the project with new units. This would enable testing on relatively poor trackage and address the level crossing concerns.

Community Requirements

To determine the needs of Pikwitonei and Thicket Portage, meetings were held with the following:

- a. The council and residents of each of Thicket Portage and Pikwitonei.
- b. Manitoba Department of Northern Affairs.
- c. Manitoba Health Services.
- d. Frontier School Division

Note: (Time did not permit meeting with the following agencies which would be involved: RCMP, Legal Services, Department of Mines, Natural Resources, Agriculture, Welfare, Environment, Labor, Housing, etc.)

In each case the following questions were asked:

1. How much use do you make of the current VIA service?
2. How much use of air charter service is currently made?
3. If you has a railbus service in the morning and back at night, what increases in volume do you forsee?
4. What length of stay is required in each of the communities?
5. What days of the week are best for travel to and from those communities?
6. How much baggage space is required?
7. What type of baggage? (perishable, non-perishable)
8. What special services are required?

Charts in Appendix II summarize these results and suggest that the vehicle should have seating for 25 to 30 people and a heated baggage capacity of 300 cu. ft. in addition to above the seat racks. Approximately 60% of the remote community baggage is perishable-inbound, but very little outbound. Stretcher capacity is required 24 times a year to each community so at least some seating must be collapsable to facilitate this need.

Communities initially were very concerned with the possible loss of existing rail service. During meetings, however, they on occasion satisfied their own concerns by pointing out existing problems. An example of this was at Pikwitonei where the following incident was related.

Prior to Christmas of 1981 over 30 people were left in Pikwitonei at 6:00 a.m. No one was allowed to board the train to Thompson as there was no room, so the train did not stop. They feel that with the railbus at least its capacity would be guaranteed to Pikwitonei.

Each community requested a 40 passenger unit. These probably were peak loads and could not be expected on a continuing basis.

Baggage requirements, at each community, appear the same. A couple returning from Thompson brings back baggage equivalent to 7 boxes or garbage bags. This includes 60% perishables with the balance being other purchases and laundry. Since perishables and non-perishables are often packed together at the stores, it is recommended that all baggage space be heated.

Concern was also expressed about return of snowmobiles for repair to Thompson. In these communities, this is not a recreation vehicle, but a transport necessity, and timely repair is a must. Since the baggage and freight load to Thompson is minimal as long as the baggage loading door is designed large enough, I see no problem in handling such items in the future, but not during the initial test.

In all cases, the problem with C.O.D. parcels was emphasized. In Thicket Portage freight is a real concern. One example cited was in mid December 1982 when milk delivery from Thompson was refused by the train although a VIA train did run. The local merchant was therefore forced to charter an aircraft and of course add that additional cost to the price of the milk.

Communities expressed frustration at the current lack of charter rail capabilities. The following examples were cited.

1. A community of 200-300 people can probably field only one reasonable hockey team or ball team, yet it has no-one to play. Sunday excursions between Thicket Portage and Pikwitonei would fill this need.
2. Frontier School Division would like to expose students to major activities (science fair, art festivals, sporting events, drama productions, etc.) in Thompson. These one day excursions, unless by charter aircraft are impossible. However, these needs could provide better utilization and revenue of a properly designed and sized railbus.

Meeting with the communities revealed that while the passenger needs are the main priority, it is all transportation that is a problem. If the local store could be assured of reasonable deliveries, the need of bulk buying by residents would be less if telephone orders could be filled by C.O.D., the need of picking up items for neighbours and friends would be reduced. This express freight could be handled on a morning run into the community when the baggage and passenger load is light. Again, this would better utilize the railbus and enhance revenues.

With the above in mind as possibilities, preliminary design specification should attempt to address these needs. It has become very evident that there are a number of very separate and distinct problems. These are:

1. The need of specialists and government agencies requiring arrival in Thicket Portage and Pikwitonei in the morning for a day's work (3 to 8 hour stay) and (2 to 6 per trip).
2. The need of residents of small communities to come to Thompson for 4 to 6 hours for medical reasons, shopping, meetings, etc. (15 to 30 people per trip).
3. The need for express, parcels, C.O.D.s and general store supplies from Thompson to the communities. A freight service is not being suggested only normal bus express loading.
4. The need for intercommunity excursions (i.e. hockey games, etc.) thus improving the quality of life.

These needs make it apparent that an urban bus or street car type of vehicle or service is not what is required. Rather, an intercity bus, a combination passenger plus baggage (60% perishable) and L.T.L. service is required to balance the directional loading and make the service viable.

A typical day's schedule to either community could be:

Leave Thompson	8:00 a.m.	Approx. 5 people
Arrive Thicket Portage	9:30 a.m.	express and store supplies
Leave Thicket Portage	10:00 a.m.	20 people
Arrive Thompson	11:30 a.m.	Minimal baggage and express
Leave Thompson	4:30 p.m.	20 people and baggage
Arrive Thicket Portage	6:00 p.m.	minimal express
Leave Thicket Portage	6:30 p.m.	5 people
Arrive Thompson	8:00 p.m.	minimal baggage

Both the communities and agencies stressed the need of a twice daily service, and their probable loading (40 passenger) exceeded the 10 to 20 persons per train which patronized the now abandoned trains 90 and 91. During the initial meetings the 40 passengers per day referred to by the communities seemed somewhat excessive considering the size of the communities.

However, on analysis, it is felt that the numbers expressed by the communities were peak loading and may be closer to the need due to the timing of the trains.

The cancelled trains offered a Thicket Portage resident a one half hour layover in Thompson (see Appendix I-a). Considering that the station in Thompson is approximately 1 1/2 miles from the shopping areas and the time needed for the average persons' shopping habits or medical visits this obviously does not provide the required opportunities without costly overnighiting. Compare this to Pikwitonei's current experience of 20 to 30 persons average per trip VIA loading (Jan. 5, 1983, Wed. 23 passengers).

This schedule allows a 10 hour and 45 minute Thompson layover which when coupled with three hours travel time starting at 6:00 a.m. is considered

too long, but still well used. Neither schedule provides (or provided in the case of trains 90 and 91) any possibility for consultant or government agency travel. This travel currently becomes infrequent due to cost, as it is often by air charter at least one way.

The above suggests that with a schedule similar to the one proposed, the community numbers may be more realistic, especially since many agencies have not been polled for their needs i.e. Natural Resources, Government of Canada (such as Indian Affairs) etc.

The foregoing although a criticism of current and past train schedules in one small area should not necessarily be considered a criticism of CN or VIA operating on such a timetable. It is only meant to show the community needs, and to illustrate that a train operating over 1,000 miles cannot hope to address all of these local needs. Unfortunately, unless there is a possibility of correcting a situation, no one checks to see what the problem really is, or if a different additional service is required. I suggest it is and the railbus may solve most of the problems. If this unit operates as typical intercity bus and is allowed to carry the LCL smalls and express that an intercity bus currently carries, it will.

Railbus Design Concepts

Background

During the study, as during the hearings, the conflict between rail and automotive technology (and standards) has proved to be the greatest dilemma. Therefore, it is felt that some comparison of these two modes should be made, so the design specifications retain the benefits of both modes.

Although the differences between these two modes can fill volumes it is felt that these were necessitated due to two basic differences, i.e. how floatation¹ is achieved and how the vehicle is guided and controlled. Vehicle floatation in the case of rail is achieved by building a fixed floatation media, the ties, which are bound together with the rails to provide the required area contact with the grade or ground to float the vehicle. The rail wheels are designed to ensure that each wheel will follow the rail it rides on.

The automotive industry on the other hand relies on the ground contact area of the tires for floatation. Solid tires provided very little floatation hence the development of pneumatic tires which however increase the pneumatic resistance but do not require a perfectly even surface. The control of the direction of travel is achieved by the vehicle operator controlling the alignment of one axle.

1. Floatation: the term refers to how the weight of the vehicle is supported on the ground.

The above basic differences although over simplified led to the development of the two different technologies to address the needs and problems of each mode. The flexibilities and limitations of the above criteria led to the traditions, and operating rules required today. Some of these are:

1. Weight restrictions: Due to the large ground contact area of the ties, the rail vehicle designer was limited only (an oversimplification) by the strength of the rails. The automotive designer, on the other hand, had to provide adequate floatation for the weight of the vehicle by the number and width of the tires. Also, due to the uneven surfaces of roads each tire had to hunt for the ground or road to ensure continuing floatation, balance and weight distribution. To minimize weight and thus floatation requirements, bus designers have started incorporating shape for strength, air resistance and in the event of accident planned collapse and vehicle deformation to protect the passengers.
2. Length of a train: Since each railwheel is guided by the rail it rides on the length of a railroad train is only limited by power availability to move or stop the train. A highway train's length on the other hand is limited to the width of the right of way it is allowed, since each axle in a turn may and will follow a different path to the one ahead of it.
3. Power: Due to the traction provided by the pneumatic tires of the highway unit, a great deal of power can and must be applied to start a highway unit moving and to keep it moving. A rail train on the other hand has very little traction due to the steel on steel.

To start a long train moving would be impossible if it were not for train slack. About 6 inches of slack is provided between each car, by the coupler and draft gear. The long train is started by bunching this slack so each car can be started individually until all are rolling. This train slack which could equal 25 feet on a 50 car train has necessitated the need of buff load standards on the rail roads to protect both the equipment and the passengers from the possible banging together of these cars. The railbus will not be part of a train, so these standards are no more necessary than they are on a highway bus.

These standards although perceived as necessary on rail passenger equipment are not manditory on freight equipment in North America. To find the acceptance of automotive body and frame standards by railroads one need but look at the "Road Railers". In such a situation up to 50 highway trailers are mounted on rail wheels to form a freight train.

The need for standardization by railroads in North America is not one of obstinance. It has evolved from the agreements required in the interchange rules. However a unit captive to one railroad need not be bound by these interchange rules.

Braking: Due to the length of a railway train and its minimal traction, rules establishing the requirements for a braking system which can be visually checked are necessary. This is so the brakes on each axle of the train can easily be checked. This type of brake system for a single unit I would suggest is not required and not desirable. A bus operator can determine if his brakes are working by the operating characteristics of his unit. I suggest that exposed rail type brakes are undesirable as

the winter ice and snow build-up on the brake shoes makes them relatively ineffective in winter conditions unless a light brake set is constantly applied to keep the shoes clean. I therefore believe that the automotive type brake for a railbus winter operation is safer and better than typical railroad brakes. These will also reduce braking wheel wear.

It is felt that the reason for each rule be analyzed in determining its application and need to the proposed railbus. If this is not done, the railbus will be rebuilt to become a small rail liner with unrequired extras and prove uneconomical. The weight strength obsession of current rail thinking is evidenced by the New Canadian LRC's which are too heavy to exceed 95 miles per hour on the existing track. The current leader of LRC's, the French TGV has a light body on a heavy frame, contrary to North America rail tradition. I suggest that future LRC's will start to learn from the automotive and aircraft industries and design to the needs of the specific unit and not to the largest ultimate unit.

Another example of tradition in action is the British Leyland railbus. This unit, which is built on a railway standard type chassis and a light body, fails on two counts. One, its weight would not activate conventional signal equipment; second, due to the light body and heavy chassis it was felt that the roof may deform somewhat on rollover. Body deformation on impact or rollover is not perceived to be unacceptable in either the aircraft or automotive industries. Why for rail?

Sweden is currently the leader in light vehicle signal activation technology. This technology has not been thoroughly tried in North America as the need of lighter equipment has been ignored. The demonstration project may provide an opportunity for the unbiased testing of this Swedish technology.

It is therefore suggested that in the next generation of North American railroad equipment these standards will change. The specifications for the railbus should therefore be looking to the future and not be an attempt to duplicate a "Sherman tank" of the past. The railbus should minimize existing body changes of the basic bus and recognize that this basic design meets all the requirements of highway transportation of people and goods. Major efforts should consider what modifications are necessary to the suspension system, and test these in the suggested demonstration project.

Bus Manufacturers

Using the foregoing thoughts as a basis, the following bus manufacturers were contacted in Manitoba:

1. MCI with W. Martin, Vice President & General Mgr., G. Schwarts, Manager Production Engineering A. Neissner, Manager R&D
2. Winnipeg Coach Sales and Service - bus rebuilding and customizing O. Ochitwa (proprietor), H.A. Luckhurst, Resource Development Assoc. Ltd.
3. Superior Industries, Morris Manitoba, Ben Sabourin, Vice President, Marketing, Ron Armstrong, Vice President Operations, Mark Wilkins, Design Engineer
4. Flyer Industries R. McKay, President, M. Marcus, Design Engineer

After a brief outline of the anticipated size requirements, proposed location of service and type of use, each manufacturer was given a short rundown on rail technology differences. Then, each was asked if they could modify one of their production units to meet our needs. Each was asked to submit a preliminary proposal of:

- a. How the problem could be addressed (including turntable)
- b. What the approximate cost/unit would be.

It was felt that this approach at this time would be the best because:

1. Each manufacturer knows his product best and therefore should be able to determine how best to modify his unit without destroying his design.
2. This approach provides for brain storming of different specialists without limiting their scope.
3. The purpose of this study is not to provide final detailed specifications for each model of bus considered, but rather to provide a general outline of what should be considered.

The average meeting lasted about 3 hours, with a great deal of interest indicated by all. The concept appeared to be a worthwhile challenge to all. Flyer, although interested and would cooperate if requested, pointed out the shortcomings of an urban type bus for our project. These were that an urban bus is designed for fast loading and unloading of short duration passengers (average passenger rides 5 minutes). Therefore, riding comfort (seating, heating, noise, etc.) is not designed into the bus as they are into highway units. Frequent starts and stops are a necessity, therefore engines, transmissions and braking systems are designed for rapid accelerations at the expense of fuel economy. Consequently, only the basic shell would remain unchanged for a railbus use to which modifications may destroy existing built-in electrical systems. The resulting cost of modifications would probably be more than the fanciest highway type bus.

All other manufacturers seemed very positive, and the following are some of the intitial thoughts expressed by them:

1. The majority felt air suspension would be the most satisfactory. In each case, I suggested that consideration should be given to marrying the two air bags on each axle. In this way, if one went flat the diagonally opposite one would not rise making a derailment possible.
2. M.C.I. felt their "S" suspension eliminated many of spring suspension problems in conversion.
3. All manufacturers felt the need of utilizing their smallest engine for rail operation and thus achieving 10 to 15 miles/gal. of fuel for their largest units.
4. It was suggested to each manufacturer that an auxiliary independent heating system was mandatory. Superior (school buses) whose heating system at -40° is inadequate (about 55° F), suggested electric heat back-up and auxiliary system. The electricity could be generated by an independently powered auxiliary generator operating on the bus's fuel. Thus, either system could maintain $+55^{\circ}$ F at -40° and combined could raise the temperature to any desired level. This concept (used on any unit) appeals to me as its operation would be tested daily and not left to an emergency.
5. Winnipeg Coach suggested an older model highway bus would be the easiest to convert, as it has a rigid frame. Of course MCI points out that with their large under seat baggage space, any additional supports can easily be added without disturbing the basic unit.
6. Winnipeg Coach also suggested adding a power winch to the unit which may be useful in rerailing or turning the railbus.

7. M.C.I. suggests a dual transmission (similar to Hydro) and operating the unit from either end thus eliminating the need of a turntable. They further suggest that two fixed axles may be adequate, thus eliminating the expensive steering axle.

Railbus Type Operation

Meetings were also held with I. Henderson of the Greater Winnipeg Water District and with Winnipeg Hydro to determine operating experience with their equipment. A summary of the major points are listed below:

Winnipeg Hydro Experience (Appendix III) Rail Bus Specifications

- 1970 school bus (Wayne) selection was due to availability
- 360 V-8 engine (gasoline)
- Engine replaced once
- Odometer as of Dec. 1982 184,991 miles
- Standard 4 speed transmission (original still in service)
- Treefarm transmission added to allow for 4 speed reverse
- Front wheels replaced by pony-truck which was salvaged from a previous unit no longer required
- Pony truck allows for 13° swing
- Pony truck wheels 20" diam.
- Rear axle original
- Rear wheels and road tires replaced with 38" diameter standard cast rail wheels. Holes for studs machined by Arne's welding in Winnipeg
- All wheels originally tired
- No sanders
- Standard leaf springs on rear not modified
- Brakes are standard hydraulic on rear (original truck equipment)
- Front brakes (on pony truck) are vacuum assist. Front brakes are not used in normal operation only for emergency.

- Pilot plow mounted 2" - 3" above rail
- Wire track cleaning brushes mounted on pilot frame. Brushes are approximately 8" x 3"

Winnipeg Hydro Operation and Observations

- Very few derailments - causes were operator error such as running through switch. No serious damage incurred due to derailments.
- Problem with studs on rear axle. Studs are prone to shear and require replacement approximately once a year. Problem causes have not been determined as stud cost is considered minor. The problem may be due to poorly fitting studs, metal fatigue due to pounding on the rail joints (60 lb. rail maximum length 30'), or due to curve pressure on the fixed wheels while backing (unit has been backed up often up to 7 miles). The latter would not be considered a factor normally, however, on this trackage it must be remembered that superelevations are not maintained and the curves are very tight, one curve having a radius of only 228 ft. In any event, this problem could easily be engineered out.
- The tires started slipping on the wheels so they were welded solid. On a unit of this weight, I would not recommend tired wheels, rather I would suggest formed steel rather than cast should be considered.

In checking Hydro's fuel consumption, it was found that their railbus averaged only about 6.5 miles to a gallon of gasoline compared to 8 on a road school bus they operate in the area. After a demonstraion ride it was discovered that the railbus backs up about 1/3 the time and this reverse mileage is not only not recorded by the odometer but infact is

subtracted. The performance is obviously far more superior than indicated.

Hydro also claims that the maintenance costs of the railbus are much less than the costs of their road school buses even though it is an older unit.

Winnipeg Water District Experience and Suggestions

- Henderson prefers the two or four axle rather than the 3 of Hydro. He feels the 3 axle could create more problems in reverse operations than the 2 or 4. Converting a short light van to two axles is adequate and easiest.
- Henderson also fears a broken spring or spring mount. One broken rear spring can easily cause a derailment on a curve. The heavy I beam frame installed on Henderson's unit, provides protection from this, however, I feel it is overdesigned and is a partial attempt at a buff load provision.
- Turntable technology is not new and is common on track maintenance equipment. Henderson favours a dual column turntable for stability. His suggestion is a valid one, and with size of a bus I would suggest 3 or 4 columns on the same 4 foot plate be considered. Also, due to wind on the large cross section of a bus, possibly rail clamps attached to the lift plate should be considered as well as the winch mentioned earlier.

Suggested Design Specifications

As previously stated possible manufacturers were given little to guide them in their original proposals. However, prior to selections the

following criteria should be considered by a design selection committee.

It must be remembered that the intent is not to destroy the basic bus design rather, with a few exceptions, to consider which of the following aspects could easily and economically be added to the railbus. It may be that for the expediency of the test, the first unit would have very few of the modifications. However, as knowledge is gained during the project and engineering personnel become available, other refinements may be added to the second generation railbus.

Special Requirements

Seating

- 25 or more
- allow for at least two stretchers
- rail mounted seats to provide seat stacking for freight if necessary

Baggage Space

- over the seat baggage racks plus a heated baggage/freight compartment of about 300 cu. ft. (probably at rear of bus). Baggage space should have shelves or bins for efficient storage of baggage and/or freight.

Doors

- Ideally 2 passenger doors, one on each side of driver with the driver's seat mounted in the front center of the bus. This would

allow the driver to disembark on either side, to throw a switch; and for passenger loading and unloading from either side. The bus could therefore be unloaded turned and then reloaded without passengers crossing tracks. Doors must be large enough to allow for stretcher loading. Baggage doors on both sides would also be an advantage.

Suspension

- Concern of the adaptability of automotive type suspensions has been expressed. In my opinion, they and their mounts could be strengthened and their no-load extension minimized for the following reasons:
 1. The no-load extension may necessitate jacking up a vehicle on a turntable over a foot to clear the rails. This no-load suspension is not necessary since the independent hunt for the ground or pothole is not required.
 2. Since the parallel rails can be considered near level, axle balance of the load as well as wheel balance should be considered i.e. marrying of air bags especially the rear for safety.
 3. Strengthening of mounts and suspension and axles is recommended for two reasons; first in the event of a broken rear spring so the diagonally opposite wheel does not rise, and secondly in the event of a derailment damage will be minimal. Additionally, the Henderson type of frame would be a real advantage in the event of a derailment, as it would protect the exposed underside components from damage (such as transmission, universal, etc.) At most, I would suggest removing the loose automotive spring, replacing it with one that has little play; then, bolster the spring mounts to accommodate the rail wheels. Do not look for total indestructability, but consider added protection by adding a "Henderson" type frame where necessary.

Engine

The engine horsepower could be 10% to 25% below the normal highway requirement for the same area and vehicle. The decrease in resistance due to the steel on steel should require less power. Also, an over-rated diesel will not work hard enough to heat up and provide the required heating for the bus. A diesel engine would be preferable. However, if it is underworked a gasoline engine would be more satisfactory.

Transmission

Again, as a personal preference, I recommend the "Idiot proof" automatic; however, the standard transmission with a good operator is great.

Heating

As a rule of thumb, I would suggest that the heating system should be rated at maintaining 85° F at -40°. Anything short of this would be fool hardy. As previously mentioned, I feel an independent emergency heating system capable of maintaining 55° F at -40° is mandatory.

The use of the bus fuel from its tank to operate the system is preferred. Too often I have found supposed emergency supplies out of fuel, because the mandatory checks were not carried out, and items such as propane have been required for backyard barbeques and not replaced.

Insulation

Maximum foam insulation (depending on bus design) should be included.

Air Conditioning

If no air conditioning is included then numerous screened vents are a must. Anyone suggesting otherwise should be invited to experience northern Manitoba blackflies and mosquitoes.

Washroom

Although not considered by me originally, it is a must. As one northern resident put it "while my wife shops, I grudgingly wait in the pub. One and a half hours is a long way home without relief".

Wheels

Unless standard rail trucks are installed I would recommend a railwheel as near to original tire diameter as possible. Also, formed steel wheels rather than cast should be investigated.

Pilot Plow (Front end only)

It is recommended that a frame mounted pilot plow be installed the normal 3 1/2" above the rail. This would serve a number of functions:

- cow catcher (or deflector)
- operator protection
- snow removal

Additionally flange or rail brushes be installed for ballast and snow removal.

Sanders

Sanders should be installed and tested on the first unit.

Radio

The need of a radio is obvious; furthermore it is suggested that radio dispatch orders should be considered (see Appendix VI-a,b,c, for examples). In any event, a back up communication system is essential. A mobile telephone may be the answer as it is a totally independent system at both vehicle and base.

Trailer Hitches

Trailer hitches were requested of each manufacturer. Again, a two fold use is suggested. First, as a tow bar for a disabled unit, and second if expanded seating is required the baggage could in future units be put in a heated baggage trailer.

Positive Lock

Since the railbus driver will leave the controls unattended while lining switches, a means of locking the vehicle's transmission without shutting off the engine should be a must. This would provide a safety factor similar to the engineman's removing the reversing lever.

Deadman's Switch

By using the existing accelerator pedal rather than a hand throttle the need of a deadman's switch is minimized. If this is a concern, placing a cut off switch under the accelerator, which would be activated when the pedal was pushed to the floor would address this concern better than the existing rail deadman switch.

Independent Axles vs Railtrucks

For years rail hunt was solved by the use of rail trucks. Having two or more axles mounted on the same truck should minimize the amount of "hunting" the wheel does on curves.

However, in recent developments in Europe, we find they are abandoning the 4 axle car for the 2 axle. No doubt with modifications to the suspension, it is suggested that if a standard 40 foot bus is used the two axle be tried. It is further suggested, some experimenting be done on the front (steering axle); for example, a compromise between the single axle and the axle truck may be achieved by testing a removable frame with small guide wheels on it to the front axle. The result would be similar to a rail truck utilizing the high rail guide wheel principle. The small wheels could be trailing for safety. A simple gauge could be mounted on the axle to measure the amount of hunt with and without the small wheels.

Organization and Administration

Since this test has not been initiated by one of the two transportation bodies (CN or VIA) in the area, it is suggested that the following structure be established for the test (see Appendix IV).

Steering Committee - The reason for the interest and participation of the suggested members of the above committee is self evident and no doubt open to some debate. However, it appears evident that some policy and monitoring committee should be formed for the demonstration project.

Project Co-ordinator - Although a project of this size cannot justify a full time project manager, it is felt that someone based in Thompson be charged with this responsibility. With the reluctance expressed by both CN and VIA to undertake the project initially, the individual should not be an employee of either group; rather he or she should be an interested transportation generalist based in the Thompson area.

It is felt that these duties would require one or two hours per day average ensuring the railbus' needs and problems are addressed. It is suggested that one of the first duties of the committee be to select and hire this co-ordinator or manager who would then function throughout the demonstration project ensuring its continuity.

Other Functions - With the exception of drivers and their training which will be addressed separately, the need of the other support groups is obvious. Clerical assistance for the co-ordinator and monitoring staff could be contracted through some interested agency such as the Norman Regional Development Corporation in Thompson. The make-up, size and scope of the monitoring staff would be determined by the steering committee

and the funding agency. Dependent on the dollars available, this monitoring group could be simply one of transmitting statistical data up to a full R & D back-up group at some major center.

The involvement of CN station agents is of course necessary for baggage and/or express.

Drivers - Every effort should be made to make this a one-man per unit operation. Arguments of safety requirements demanding two or more do not make sense in light of the following points:

1. In the case of a train, two men are often required at the headend as the design of the locomotive (especially on switch engines) provides the engineman poor visibility. This is not the case with a bus.
2. When backing a train up, the visibility is even worse due to its length, however, since the intent is never to back the railbus, this is not a problem.
3. Buses travel all over this country safely with one driver whose alertness and dexterity requirements are much greater than those of a railbus driver since there will be no steering required on the railbus and no side access to the tracks.
4. The one supposed argument for a two man crew is to provide a man to throw the switches and thus prevent delays. Since the unit will probably not have a rear passenger door, the bus will have to wait for whoever lines the switch to walk back to the front door. The time difference will therefore be negligible between one or two man operation.

5. Emergency flagging procedure is another current argument for a two man requirement. Due to the relative inactivity of the rail line, this is a minor problem. Additionally, with any kind of radio dispatching all units in the area can easily be alerted to provide time for the operator to place his fusees, flags and torpedoes to protect his unit.
6. As already discussed, the need of a brake test and air leakage test is not required on this single unit.

Suggested Operator/Driver Qualifications

1. Class 2 (or better) licence with air brake endorsement. Highway bus operating experience is an asset.
2. Appropriate portions of engineman's training at CN Gimli Training Centre. Obviously, locomotive operation in total is not required as the operating characteristics and equipment are different; however, more than brakemen's training is required. Items such as the operation of a 26 L or 24 RL braking systems or complete train dynamics (control of train slack, etc.) will serve of little benefit to a railbus driver; however, a complete knowledge of operating rules is mandatory.
3. The physical requirements of the job will require the driver to do most of the loading and unloading along with lining his own switches. It will not be a pre-pension, "grazing" job.

The cost of driver training (assuming a properly licensed driver is hired) would probably be less than \$2,500 plus salary for the time spent at Gimli. This cost estimate can be negotiated with CN when required.

Project Administration Costs

- Project Co-ordinator or Manager: depending on time and response - \$6,000 - \$30,000/year.
- Clerical costs: \$2,000 - \$12,000/year.
- Monitoring (Data collection, engineering revisions, etc). Depending on funding, could be part of co-ordinator's function or a combination of local and remote staff and cost could vary from: 0 - \$50,000/year.
- Travel: The scope of project again will determine this cost. If the intent is only to administer and operate the railbus and report in writing, then travel will be minimal. However, if the co-ordinator is expected to:
 - a. supervise construction;
 - b. supervise modifications;
 - c. investigate possible improvements;
 - d. work with a design team in the design of the vehicle;
 - e. visit Toronto subway, study Swedish signal practice, study British and other European railbus';the cost could escalate to the level of funding available.

Advertising - This would be minimal, probably sending letters to each agency informing them of the service coupled with schedules posted in the communities.

Miscellaneous - Phone, stationary, postage, would probably not exceed \$200 per month or \$2,400/year.

Maintenance of Railbus

Capital - A building for maintenance and storage of the railbus must be provided. Wide Span Steel of Winnipeg (Armco Building distributor) who are familiar with Thompson, were asked to provide a cost of a building for this purpose.

The rough specifications suggested were:

- size approximately 18 ft. x 50 ft. and over 15 ft. high.
- complete with - insulation
 - bus access doors
 - wiring
 - lights
 - electric heaters
 - erected in Thompson

The cost quoted was between \$27,000 to \$32,000. I suggest \$50,000 be used for estimating purposes to provide for unforeseen items such as a possible service pit.

Building Energy (heat and lights) - Manitoba Hydro were contacted and again a rough estimate was used. Based on 40 KW continuous consumption year round \$6,000. Obviously, insulation, door opening frequency, etc., will vary this number significantly.

Maintenance of Railbus - Grey Goose were asked to supply bus maintenance costs, including both average per mile repair costs plus approximate per trip costs for items such as cleaning interior, washroom maintenance and washing. Secondly, they were asked if they were interested in doing the total bus maintenance package on the railbus.

Costs and Revenues

Assumptions:

For the purposes of the first year costs the following assumptions were made:

1. Unit to operate 3 days per week to Thicket Portage and 2 days per week to Pikwitonei. Assuming 2 round trips per operating day the weekly mileage would be 45 miles x 4 trips/day x 5 days/wk. x 52 weeks = 46,800 miles/year rounded off to 50,000 miles.

2. Operating labour (hours/day):

Morning trip:

20 min. prior to Thompson departure

1:30 min travel

20 " unload and reload

1:30 " travel

20 " unload and park

4 hours per round trip

Evening trip as above.

Total 8 hours/day or 40 hours/week.

Part time driver required for vacation relief, sickness and charters.

3. Maintenance to be contracted out to local garage or local bus operators and performed to manufacturer's specifications. Maintenance to include cleaning and fueling, thus minimizing overhead.
4. Annual labour costs were estimated at \$35,000. This number was chosen as it exceeds Inco's current average hourly rate plus fringes. Since Inco's rate for a 40 hour week exceeds both CN and Bus Company costs it is probably overstated.
5. During the demonstration project the costs of experimentation, monitoring and administration should be kept separate from those continuing costs of operating, capital, maintenance and operating overhead.
6. Depreciation: A straight line depreciation is indicated in current calculations of equipment based on a ten year write off with no cost of money in the calculation. Mr. B. Thiesen of Grey Goose informs us that unlike rail equipment which has little or no resale value, a 10 year old intercity bus can be refurnished and sold for its original price. Therefore, the line depreciation used which appears low for rail calculations may, in fact, be very high due to its salvage value.
7. The building also assumes a line depreciation based on a 20 year write off and no salvage value. Certainly the building will last more than 20 years and also has a salvage value.

Cost Analysis

Capital

	Total	Life	(Line) Annual Dep.
Building	50,000	20 yrs.	\$2,500

Driver training (assume 1 month) \$5,000

Capitalization of project monitoring over 3 years.

BUS (see Appendix V) for quotes.

Model	Superior Henderson frame	MCI MC9	Bluebird Ford	Winn. Coach MC9	Used Flyer Intercity
Cost	\$141,900	291,203	168,900	286,900	103,900
Life in years.	10	10	10	10	10
Depr/yr	\$14,200	\$29,120	16,890	28,690	10,390

Note:

1. Although standard life of 10 years is assumed for all units, it must be recognized that MC9 will require less maintenance and last longer than any other unit considered as evidenced by its superior warranty. The true useful life is probably 20 years.
2. Contingency costs were assumed at 10% of unit costs, thus varying from \$10,000 to \$26,600. These should probably be constant for all units therefore reducing the cost of the MC9.

Operating Costs (first year)

Labour (including fringes) one man,	\$35,000/yr.	\$50,000
Backup operator	\$15,000/yr.	
Building Energy (heat, lights)	\$ 6,000/yr.	
Maintenance Costs		
$\$0.31^1 \times 50,000 \text{ mi.} =$	15,500 (2)	
Operating Costs		
$\$0.41^1 \times 50,000 =$	20,500 (3)	
Total	\$92,000	

The operating costs have been overstated by 25 to 50 percent for this first year of operation as compared to expected costs during full operation in the subsequent years after the test. These costs therefore can be considered worst case for the following reasons:

1. Low first year equipment utilization.
2. Due to the above coupled with low speed limits and higher than expected labour costs, results in an operating labour cost of \$1.00/mile compared with the bus line actual of 46 ¢/mile.¹
3. Building cost, again due to low equipment utilization results in a cost of 12 ¢ depreciation per mile rather than the bus line actual of 5 ¢¹ per mile.

1. See Appendix VII a

4. Maintenance costs will be greatly reduced (Appendix VII a - Page 2)
5. Operating costs due to the improved fuel efficiencies, 10 to 14 miles per gallon compared to the bus actual of 7.4 miles per gallon will significantly decrease expenditures.

Although running rights costs have not been estimated items such as insurance, license and highway fuel tax have which further inflate these costs. Considering that the projected revenues should increase once the service proves itself, it would appear that even with running rights costs included a 30 percent reduction in operating unit costs is a realistic expectation. This would indicate that the operation would, in the long run, at least cover all operating costs.

Possible Revenues

Assuming 30 round trip fares per day 5 days per week at \$8.00 would generate:

$$30 \times 5 \times 52 \times \$8 = \$62,400 \text{ per year}$$

This would be considered year one loading based on the suggested schedule. Any extension to the initial 3 + 2 schedule would be additional. Suggested fares are those currently charged by VIA.

It is suggested that parcel service tariffs be those charged by the bus companies (Appendix VII - a) and not those of CN Express (Appendix VII - a). Possible revenues in this area have not been studied, however, it is suggested that for purposes of this report the average bus passenger to freight split of the bus companies be used. This would no doubt be higher in this captive under serviced area however using 12 percent the bus company first year average the minimum expected revenue is \$7,488.

No attempt has been made to calculate the possible mail potential. It is apparent that this service could offer better mail service than that now in place.

It is suggested that in the case of ticket sales, freight handling etc, by the VIA and CN station agents, remuneration of the parent company be on a percentage of the revenue. The percentage negotiated should be similar to the travel agent commission. Free baggage should be restricted to 3 pieces plus one carry on per person. Any excess providing it does not exceed normal baggage size and weight could be carried at say \$1.00 per piece to a maximum of 3 additional pieces.

This type of rate is consistent with bus company loading of available space. The reduction in rate from normal express tariff is justified since it does not go through the express office and is delivered to and picked up from the bus baggage door. Anything above this limit should move as express or freight.

It must be remembered that no additional revenues are indicated for charter and other services.

Running Rights

It is recognized that CN's re-imbursement for running rights will probably be negotiated by the appropriate government bodies and therefore not subject to discussion in this report. However, there are a few points that should be considered during those discussions:

1. The impact of the individual components making up the cost should be considered and not having the "superintendency" as a catch-all.
2. CN and VIA's arguments that the railbus was so light that it would not activate the rail signals, suggests it is too light to remove rail rust to allow positive contact between the rails and the railbus wheels. Surely something this light cannot appreciably damage the grade or add noticeably to rail wear. Therefore only a convenience charge may be in order.
3. Dispatching services will be required of CN. Since it is not foreseen that additional staffing or equipment will be required, the charge should be minimal.
4. Certainly any cost incurred by utilizing the stations or agents must be compensated and a commission appears a realistic approach.
5. Depreciation is normally derived by anticipating the useful life of piece of equipment. The 50 year life (consistent with CN Rail's financial practice¹) recovers the replacement cost of the track construction in 50 years. In the case of trackage it must be remembered that only the rails and ties will require replacement the original grade due to the annual maintenance is timeless. In 50 years the grade will be better than it was in the first year of operation. The cost of the grade should not continue to be depreciated on replacement cost but rather the original cost resulting in zero depreciation after 50 years.

1. 1981 Annual Report Canadian National. Note "f" to Consolidated Financial Statement.

6. Insurance - CN has always been self insuring and may wish to include this in its port folio. If so, its charges should not exceed the cost of coverage provided elsewhere. It is suggested that agencies such as MIC, along with private companies, be approached to establish comparative rates.
7. Other - The items so far mentioned are the major components and any item missed should be evaluated on its own merit and not on a prorated percentage of CNR's total overhead costs.

Research Possibilities

During earlier hearings criticism was directed at VIA for not having researched low density movements. VIA's prime interest will probably be to direct its research resources to the areas perceived to be of greatest possible financial return. In VIA's views, this will probably be the corridor routes and the Transcontinental. The potential gains in a limited market area may appear to be insignificant in comparison. The social needs of these small market areas however are the greatest. Similar needs to the suggested test area are found throughout this country and the demonstration project would provide an opportunity if sufficient funding is available to develop a proper vehicle to operate anywhere.

Dependent on the amount of funding, the following items could be investigated:

1. Turntable design: single, double and triple columns.
2. Suspension systems: Improvements suggested to minimize yaw and maximize stability.

3. 2, 3 and 4 axle and variations: The effects of various axle arrangements on wheel hunt and ride.
4. Rubber or other type tires: The noise muffling items currently being used by subway trains.
5. Radio dispatching: This continuous contact is now in use in at least one region of the British Rail and could be tried here.
6. Light vehicle signal activation: Arrangements could be made with INCO to make regular runs to test Swedish technology on INCO's level crossing signal lights.
7. Level crossing snow windrows: Again, the effectiveness of the snow plow on level crossing snow banks could be tested at both station road and the INCO plant road as required and modifications made to the pilot plow.
8. Effects of vehicle size: By developing gradually, it may well be found that more than one size is required. For example, starting with something like the Superior Bus for the short and charter hauls it may be found that a large van or mini bus may be ideal for emergency medivac and back up. However, something like an MCI MC9 is required on the long haul. Although standardization has its savings, it often destroys service and revenues. For example, it would appear that PWA standardizing their fleet to 737 were forced to cut flights which might have destroyed passenger loading. The F-28 was better sized to the northern market. In the case of the railbus the standardization may require only to remain as close as possible to existing bus designs rather than the British Leyland one model fits all.
9. Extensive wear and fatigue testing of major components: It is recommended that frequent inspections be done and lubricant samples

taken for analysis to determine the condition of engine, bearings, transmission, wheels, suspension, studs, etc.

10. Once the equipment has been proven experimentation at higher speed should take place.

Recommendations

Based on the preliminary analysis with very low utilization of equipment and before running rights reimbursement for CN it would appear that "Thick-Pik-Bullet" could operate at a first year loss of some \$30,000. This would suggest that with proper equipment utilization this type of service may become selfsustaining. Certainly the preliminary indications appear encouraging enough to proceed. I would recommend the following:

1. A committee be appointed to review the data and prepare submissions to obtain the necessary funding.
2. Since this is an area of federal jurisdiction and future benefits could be for numerous regions of Canada, the funding be a federal responsibility.
3. The scope of the funding to include:
 - a. Design and purchase of an initial vehicle sized for the initial test area.
 - b. Once the first unit has proven itself, provide funding for a second back-up vehicle. (a minibus or large van) This could provide assistance in the event of break down and fill-in during the linear extention (once weekly runs to Ilford and Gillam).
4. Provide a third vehicle in the final year of the test sized to the Pas/Flin Flon, Sherridon, Pukatawagan and Lynn Lake market.

5. Funding should include garage/storage building and guarantee all operating monitoring and modification costs.
6. During the life of the project one goal should be to develop positive means of activating automatic rail signal equipment.
7. Although this project was initiated for this area, the value of the knowledge for other areas must not be minimized.
8. Versatility must be maintained both in vehicle size and use.
9. New rules be written to suit the equipment determining the needs and not based on rail tradition or interchange rules.
10. Equitable payments for running rights be negotiated.
11. A close liaison must be maintained with the communities. This is not only true of this project but of any subsequent extensions into other areas.
12. To truly test the project, it is suggested that funding be provided to complete a total 3 year test. This should include the following:

	<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>	<u>Total</u>
	\$	\$	\$	\$
<u>Capital Costs</u>				
MC9 railbus (p 38)	290,000		290,000	580,000
School bus or mini as lockup (p 38)		140,000		140,000
Modifications	50,000			50,000
Building/garage (p 34)	50,000	50,000		100,000
Project Monitoring and Administration	<u>100,000</u>	<u>100,000</u>	<u>100,000</u>	<u>300,000</u>
Total Capital Requirements	490,000	290,000	390,000	1,170,000
<u>Operating Losses - assuming worst case (year 1)</u>				
Passenger Revenue (p 40)	62,400			
Freight Resources (p 40)	7,488			
Less 10% sales commission	<u>6,988</u>			
Total Revenue	<u>62,900</u>			
Worst Case Operating Costs (p 39)	<u>92,000</u>			
Operating loss	29,100			
Say	30,000	60,000	90,000	180,000
Overhead (See p 33.)	<u>30,000</u>	<u>30,000</u>	<u>30,000</u>	<u>90,000</u>
Total Cost of the Demonstration Project including \$1,170,000 of capital cost.	\$520,000	\$380,000	\$510,000	\$1,440,000

As previously indicated these are maximum costs and would establish sufficient equipment to test the Thompson-Thicket Portage-Pikwitonei-Ilford-Gillam and provide one year of testing in the Flin Flon/The Pas-Sherridon-Pukatswagon-Lynn Lake area.

13. If the test is to truly be for universal use it is felt that both a school bus and an intercity unit be tested. Any units tested should be new not used for the following reasons:
 1. A used unit will create additional maintenance problems.
 2. Any time and money spent on design should be available for future units and not have to be redone because the unit is obsolete before it starts.
14. Rather than the originally suggested bus layout with a washroom located on a fixed bulkhead part way up the railbus, I would minimize the original layout to something similar to the sketches in Appendix VII - b. By using airline type webbing or other such unit as a bulk head, seating can be added or removed as required.

Summary

The most startling fact revealed during this study was that the railbus is not new. They in fact operated successfully throughout the United States up to 50 years ago. Their demise was due to two factors. First because of the construction of roads during the thirties and WWII which coupled with the railroads standardization of equipment and their pursuit of volume marketers.

Railroad companies without exception saw themselves in the business of running trains rather than providing transportation as may be required. As a result, these railbuses were never replaced and were allowed to

deteriorate and die. Had the rail roads continued with the railbus as a remote community access to larger communities, they might have delayed their financial woes and would have helped maintain the small communities.

An example of a small community dying due to lack of transportation is Thicket Portage. Thicket Portage has some of the best agricultural potential in the North. It has a larger community, Thompson, 45 miles away that would gladly purchase the vegetables raised. However, since the market is small there is no transportation to bring the 10 to 20 boxes frequently to market. Nor is there a convenient means of transporting the Thompson staff of the Department of Agriculture to assist the Thicket Portage residents in their endeavour. Also without convenient access to the amenities of a larger center, these residents are robbed of the quality of life they deserve.

Pikwitonei is another example of the passenger travel dilemma. L.E.A.P. grants have made the operation of a local Pikwitonei sawmill possible. CN rail can effectively haul the product to market. However, due to the transportation isolation over a year of advertising was required to attract an experienced millwright and a Production Manager. Considering the national jobless rate the above emphasizes the importance of accessibility to the outside world both by the prospective employee and by the L.E.A.P. officials charged with monitoring the project for four years.

The demand and need of the low density service is real and surpassed all my expectations. The technology is available and the principle of a railbus has been proven in the early days in the United States and Manitoba. The project however must address more than just passengers. It must look at mail and express as a bus company does. The railbus

project does not require the wheel to be invented or reinvented. What is required is the desire and co-operation of all concerned. This coupled with the funds will provide the opportunity to update this technology and develop a much needed economical regional low density service. Surely if densely populated Europe has recognized the need for low density rail service, it is time sparsely populated Canada did the same and made a positive step to promote its development.

**Number/
Numéro**

2

RAIL BUS FEASIBILITY
A Preliminary Evaluation
of a
Proposed Railbus Demonstration Project
Part II of II

M.J. Babulic

Prepared for
The Manitoba Department of Highways and Transportation
Passenger Policy Branch

Winnipeg

March, 1983

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APPENDIX I-a

TIME TABLE No. 22-JUNE 1st, 1981

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NORTHWARD TRAINS				TRAIN DISPATCHER STANDARD CHANNELS AND TONES	MILES FROM THOMPSON JCT.	YARD LIMITS	THOMPSON SUBDIVISION		OFFICE SIGNALS	SIGNAL CAPACITY IN FEET	SOUTHWARD TRAINS			
FIFTH CLASS	FIRST CLASS						STATIONS	SECOND CLASS			FOURTH CLASS			
	93	91	94					92			90	95	882	
	Page	Page	Page					Page			Page	Page	P.1	
TUESDAY THURSDAY	MONDAY WEDNESDAY FRIDAY	TUESDAY THURSDAY SATURDAY	SUNDAY WEDNESDAY FRIDAY	Channel 2-Tone 2	0.0	↓ 2.3	THOMPSON JCT. JCT. WITH TRICKET SUB 8.4	PRYZ			1010	1600	1936	1430
0435	1440	1255	0625		8.4		JOHNSON 12.7	P	1840		0952	1542	1918	1413
0510	1528	1343	0708		21.1		PARLEE 8.6	P	1850		0922	1512	1852	1343
0540	1547	1402	0726		29.7	↑ 28.9	WINGATE 0.8	YZ			0904	1454	1834	1319
0545	1605	1420	0745		30.5		THOMPSON	KPWZ	HO		0900	1450	1830	1315
RULES 41 AND 44 APPLICABLE														
03	93	91	94								92	90	95	882

THOMPSON SUBDIVISION FOOTNOTES

- 1 **UNIFORM CODE OF OPERATING RULES**
 - 1.1 **TRAIN REGISTER MODIFICATIONS**
Thompson Jct.—Register station for regular trains only.
 - 1.2 **SPECIAL INSTRUCTIONS**
System 1.8—Thompson Jct.
- 2 **GENERAL FOOTNOTES**
 - 2.1 Wingate—Trains using wye will back train into tail of wye. Tail or wye is 1774 feet long.
 - 2.2 Regulations for the Protection of Track Units and Maintenance Work
Sections 10 and 11 0 applicable between Thompson Jct. and Thompson.
- 3 **EQUIPMENT RESTRICTIONS**
Unless authorization received from Office of General Supt. Transportation, the following will apply:
 - 3.1 Heaviest car permitted (including contents)
263,000 lbs.
- 4 **SPEEDS**

4.1 Mileage	MILES PER HOUR
0.0 to 29.5 Zone	All Trains
12.9 (over Bridge)	30
29.5 to 30.5 Zone	15

Note no level crossings.

APPENDIX I-b

76

TIME TABLE No 22-JUNE 1st 1981

NORTHWARD TRAINS					TRAIN DISPATCHER STANDARD CHANNELS AND TONES	MILES FROM THE P&S	YARD LIMITS	THICKET SUBDIVISION	
FOURTH CLASS		FIRST CLASS						STATIONS	
295 Mixed	803 Fri	95 Pag	93 Pag	91 Pag					
SUNDAY	TUESDAY THURSDAY	MONDAY WEDNESDAY FRIDAY	MONDAY WEDNESDAY FRIDAY	TUESDAY THURSDAY SATURDAY					
0830	0245		1250	1110	136.4	↓	WABOWDEN	CKPWYZ	
f 0845	0255		f 1300	1120	141.9	138.4	55 MEDARD		
f 0856	0306		f 1309	1129	148.7		68 LYDDAL		
f 0912	0322		f 1321	1141	158.2		95 OOHILL		
f 0927	0332		f 1331	1151	164.3		61 EARCHMAN		
f 0938	0343		f 1342	1202	171.1	169.5	68 LA PEROUSE	Z	
f 1000	0353		f 1352	1212	177.6	172.5	65 HOCKIN		
s 1040	0405	FROM THOMPSON SUB	s 1410	s 1225	184.3	182.5	67 THICKET PORTAGE	PZ	
f 1050	0418		f 1423	1238	191.9	185.6	7.6 LEVEN		
1108	0435	1936	1440	1255	199.8	197.8	7.9 THOMPSON JCT.	PRYZ	
							JCT WITH THOMPSON SUB		
1113	TO THOMPSON SUB	1940	TO THOMPSON SUB	TO THOMPSON SUB	200.3	202.5	0.5 SIPIWESK	Z	
f 1131		1958			212.1	210.8	11.8 MATAGO	Z	
s 1135		2005			213.3		12 PIKWITONEI	PZ	
f 1143		2013			218.5	214.3	5.2 BRIDGAR		
f 1203		2032			230.6		12.1 WILDE		
f 1212		2041			236.4		5.8 ARNOT		
f 1234		2106			249.7		13.3 BOYD		
f 1244		2120			255.5		6.5 PIT SIDING	RY	
f 1304		2140			256.2		12.8 MUNK		
s 1345		2210			269.0	284.5	16.7 ILFORD	PZ	
f 1400		2236			285.7	286.6	9.9 NONSUCH		
f 1415		2250			295.6		8.1 WIVENHOE		
f 1440		2315			303.7		15.1 LUKE		
s 1500		2330			318.8		7.3 GILLAM	CKPWYZ	
					326.1	322.9 ↑			
					Channel 2-Tone 2				
					RULES 41 AND 44 APPLICABLE				
295	803	95	93	91					

THICKET SUBDIVISION FOOTNOTES ON PAGE 78

APPENDIX I-c

TIME TABLE No. 22—JUNE 1st, 1981

77

THICKET SUBDIVISION	STATIONS	OFFICE SIGNALS	SOUND CAPACITY IN FEET	SOUTHWARD TRAINS					
				FIRST CLASS		SECOND CLASS	FOURTH CLASS		
				94 Pgr	92 Pgr	90 Pgr	844 Fri	294 Mixed	882 Fri
	WABOWDEN CKP WYZ	RN	2900		1200	1750	1110	1605	1615
	55 MEDARD		1770		1145	1735	1057	1554	1603
	68 LYDDAL		1750		1135	1725	1046	1542	1552
	95 ODHILL		1780		1123	1713	1031	1525	1537
	61 EARCHMAN		1750		1113	1703	1021	1515	1527
	68 LA PEROUSE Z		1780		1102	1652	1010	1500	1517
	65 HOCKIN		1760		1051	1642	1000	1448	1506
	67 THICKET PORTAGE PZ	KG	1770	TO THOMPSON SUB	1040	1631	0950	1433	1456
	76 LEVEN		2280		1027	1617	0937	1356	1445
	79 THOMPSON JCT. PRYZ			0625	1010	1600	0920	1340	1430
	05 JCT WITH THOMPSON SUB								
	05 BIPIWESK Z		1660	FROM THOMPSON SUB	0623	FROM THOMPSON SUB	0918	1335	FROM THOMPSON SUB
	118 MATAGO Z		3220		0604		0900	1315	
	12 PIKWITONEI PZ		490		0555		0856	1311	
	52 BRIDGAR		2270		0546		0848	1301	
	121 WILDE		1780		0527		0829	1252	
	58 ARNOT		1870		0518		0820	1243	
	133 BOYD		1730		0453		0758	1221	
	65 PIT SIDING RY		3150		0442		0748	1211	
	128 MUNK		1780		0420		0728	1151	
	167 RLFORD PZ	FR	1980		0350		0702	1125	
	99 NONSUCH		1750		0328		0647	1051	
	81 WIVENHOE		1780		0315		0634	1038	
	15.1 LUKE		1780		0252		0611	1015	
	7.3 OLLAM CKP WYZ	GA		0240			0555	1000	
RULES 41 AND 44 APPLICABLE				SUNDAY WEDNESDAY FRIDAY	SUNDAY WEDNESDAY FRIDAY	TUESDAY THURSDAY SATURDAY	DAILY	SATURDAY	TUESDAY THURSDAY
				94	92	90	844	294	882

THICKET SUBDIVISION FOOTNOTES ON PAGE 78

APPENDIX I-d

- 5 -

78

TIME TABLE No 22-JUNE 1st 1981

THICKET SUBDIVISION FOOTNOTES

1 UNIFORM CODE OF OPERATING RULES

1.1 TRAIN REGISTERS

Thompson Jct.—Register Station for regular trains only.

Mileage 255.5—Only trains instructed by train order will register.

1.2 SPECIAL INSTRUCTIONS

System 1.8—Wabowden
—Thompson Jct.
—Mileage 255.5
—Gillam.

2 GENERAL FOOTNOTES

2.1 Wabowden—Siding is located between third cross-over south of station and north switch.

2.2 PH Siding—Traffic will be received and discharged at station Mileage 255.4.

2.3 Regulations for the Protection of Track Units and Maintenance Work
Sections 10.0 and 11.0 applicable between Wabowden and Gillam.

3 EQUIPMENT RESTRICTIONS

Unless authorization received from Office of General Supt. Transportation, the following will apply:

3.1 Heaviest car permitted (including contents):
263,000 lbs.

3.2 Units in series 2000-3240, 3615-3745, 4000-4017, 4400-4707, 4900-6900 and 9400-9667 must not operate on sidings at Sipiwek, Matago and Luke. When switching these sidings with these units reaches must be used.

4 SPEEDS

MILES PER HOUR

4.1 Mileage	Zone	Mixed &		DU
		Passenger	Freight	
136.4 to 158.2	Zone	50	40	
158.2 to 326.1	Zone	40	40	
174.8 to 199.8				30
196.2 to 197.5		15	15	
213.5 (over bridge)		25	25	
236.7 (over bridge)		25	25	
240.5 to 241.5		20	20	
4.2 Conditional Speeds				All Movements
Mileage 136.5 (Prov. Road 610)				
Within 600 feet of crossing until crossing occupied				15
Northward movements proceeding at less than 10 m.p.h., within 200 feet of crossing until crossing fully occupied				5

5 CONDITIONAL STOPS

5.1 Mileage 238.3—No. 94 and No. 95 will stop on flag

5.2 Mileage 278.6—Passenger and mixed trains will stop on flag.

6 PUBLIC CROSSINGS AT GRADE

6.1 Mileage 136.5 (Prov. Road 610)
Regional Special Instruction P1 applicable to movements from house track.
General Operating Instruction 1.21 B1 applicable to northward movements on siding.

7 SPURS AND OTHER TRACKS

7.1 Prendeville Lumber TK 27-28
Mileage 238.2—Extends east of track. Points face south. Capacity 250 feet.

7.2 Hydro Board (Kelsey Spur) TK 32
Mileage 255.5—Extends 13 miles west of track off tail of wye
Maximum permissible speed 10 m.p.h. Only units in series 1000-1076 permitted unless authorization received from Superintendent.

7.3 Mileage 285.6 (Station Track) TK 53
Extends east of track. Points face north. Capacity 130 feet. Cars exceeding 55 feet in length prohibited

Note:

No public Crossings
North of Wabowden

APPENDIX I-e

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TIME TABLE No. 22-JUNE 1st, 1981

83

NORTHWARD TRAINS				TRAIN DISPATCHER STANDBY CHANNELS AND TONES	MILES FROM SHERRITT JCT.	YARD LIMITS	SHERRIDON SUBDIVISION		OFFICE SIGNALS	SIGNAL CAPACITY IN FEET	SOUTHWARD TRAINS	
FOURTH CLASS	THIRD CLASS	STATIONS					FOURTH CLASS					
501 Frl	291 Mood						290 Mood	500 Frl				
MONDAY WEDNESDAY FRIDAY	MONDAY WEDNESDAY FRIDAY											
1620	1130	Channel 2-Tone 2	0.0	↓	SHERRITT JCT. PRYZ		1600	0855				
				1.1	JCT WITH FLIN FLON SUB							
1650	1156		12.7	11.8	12.7	OPTIC LAKE PRZ	890	1540	0833			
				13.9	JCT WITH CHIBEL LAKE SUB							
			21.9		9.2	HEMING LAKE P	2450	1525	FROM CHIBEL LAKE SUB			
			40.4	39.3/ 41.8	18.5	SHERRIDON PYZ	SN	1455				
			47.5	46.5/ 48.5	13.1	Z						
			53.5			RUDDOCK P	1130	1354				
			75.3		21.8	CHARLES	870	1240				
			94.0		18.7	PAWISTIK P	890	1128				
			99.1	98.3	5.1	PUKATAWAGAN PZ	1670	1109				
			121.9	100.0	22.8	JETAIT	3110	1002				
			145.5		23.6	HERRIOT P	1380	0907				
			157.3	156.3/ 158.3	11.8	DRYBROUGH Z	1600	0837				
			170.6		13.3	MCVEIGH		0805				
			184.8		14.2	LYNN LAKE CKPY	NY	0730				
RULES 41 AND 44 APPLICABLE BETWEEN MILEAGE 0.0 AND MILEAGE 183.3 MAIN TRACK OF SHERRIDON SUB ENDS AT MILEAGE 183.3 RULE 105 APPLIES BETWEEN MILEAGE 183.3 AND MILEAGE 184.8												
501	291								TUESDAY THURSDAY SATURDAY	TUESDAY THURSDAY SATURDAY		
									260	500		

SHERRIDON SUBDIVISION FOOTNOTES ON PAGE 84

APPENDIX I-f

TIME TABLE No 22-JUNE 1st 1981

84

SHERRIDON SUBDIVISION FOOTNOTES

1 UNIFORM CODE OF OPERATING RULES

1.1 TRAIN REGISTERS

Sherritt Jct.—Only trains instructed by train order will register.

Optic Lake—Only trains instructed by train order will register.

1.2 Special Instructions

System 1.8—Optic Lake.

2 GENERAL FOOTNOTES

2.1 Jettett—Derail installed on south end of siding.

2.2 Regulations for the Protection of Track Units and Maintenance Work

Sections 10.0 and 11.0 applicable between Sherritt Jct. and Mileage 183.3.

3 EQUIPMENT RESTRICTIONS

Unless authorization received from Office of General Supt. Transportation, the following will apply:

3.1 Sherritt Jct. to Optic Lake.

Units in series 2000-2399 and 5000-5399 prohibited. Optic Lake to Sherridon.

Units in series 2000-3240, 4000-4017, 4900-6900 and 9400-9667 prohibited.

Sherridon to Lynn Lake.

Only units in series 1000-1076, 1300-1397, 4206-4353, 9150-9160, 9167-9174, 9175 and 9190-9199 permitted.

Sherridon to Lynn Lake (including Lynn Lake)—on other than main track—10 m.p.h.

3.2 Heaviest car permitted (including contents):

Sherritt Jct. to Lynn Lake 263,000 lbs.

EXCEPTION—Loaded or empty tank cars exceeding 8000 imp. gallons capacity must not be marshalled next to very short wheelbase cars such as ore cars.

4 SPEEDS

4.1 Mileage

0.0 to 40.4 Zone

40.4 to 111.5 Zone

40.9 to 42.0

45.9 to 46.1

55.6 to 57.3

61.3 to 61.9

74.1 to 74.7

77.4 to 78.7

80.4 to 80.5

85.5 to 85.6

86.2 to 88.1

89.4 to 89.9

92.6 to 95.1

100.4 to 101.6

107.8 to 107.9

111.5 to 183.3 Zone

122.9 (over bridge)

132.0 to 132.8

139.4 to 139.9

147.2 to 147.6

183.3 to 184.8 Zone

MILES
PER HOUR
All Trains

40

20

10

10

10

10

10

10

10

10

10

10

10

10

10

10

10

10

10

10

10

15

5 SPURS AND OTHER TRACKS

5.1 Fay Lake SH 49

Mileage 31.0—Points face north and south Capacity 1590 feet.

5.2 ManFor (Jungle Lake) SH 62

Mileage 47.5—Points face north and south Capacity 950 feet.

5.3 Takipy Pit Spur SH 68

Mileage 65.5—Tends east of track Points face north Capacity 200 feet.

5.4 Rafter SH 70

Mileage 84.3—Points face north and south Capacity 1080 feet.

5.5 Gravel Pit SH 81

Mileage 122.4—Tends east of track Points face north. Capacity 200 feet.

5.6 Hone Pit SH 83-84

Mileage 135.5—Points face north and south Capacity 4160 feet.

5.7 Laurie River Pit SH 86

Mileage 136.3—Tends west of track Points face north. Capacity 200 feet.

5.8 Laurie River SH 87-88

Mileage 136.6—Points face north and south Capacity 390 feet.

5.9 Storage Track SH 94

Mileage 165.5—Points face north and south. Capacity 2080 feet.

* speed reductions
due to curves.

APPENDIX I-g

- 8 -

82

TIME TABLE No. 22-JUNE 1st, 1981

FLIN FLON SUBDIVISION FOOTNOTES

1 UNIFORM CODE OF OPERATING RULES

1.1 CLEARANCES

Channing—No. 501 and No. 886 must obtain clearance at Flin Flon and may leave Channing without obtaining clearance.

1.2 TRAIN REGISTERS

Flin Flon Jct.—Only trains instructed by train order will register.

Mileage 12.3—Only trains instructed by train order will register.

Sherritt Jct.—Only trains instructed by train order will register.

1.3 TRAIN SIGNALS

Fourth class trains displaying signals to Channing will continue displaying them through to Flin Flon and register them accordingly.

Trains displaying signals to Flin Flon Jct. must register such signals at The Pas.

1.4 SPECIAL INSTRUCTIONS

System 1.8—Flin Flon Jct.

—Mileage 12.3 (Root Lake Gravel Pit).

—Sherritt Jct.

—Mileage 61.0 (Pit Spur).

2 GENERAL FOOTNOTES

2.1 Channing—From 0001 Monday to 2359 Friday inclusive, all trains required to move from Channing to Flin Flon must first obtain authority of HBM&S dispatcher, who may be contacted on radio by voice calling on channel 2.

2.2 Channing—"End of Main Track" Sign located to left of main track.

2.3 Flin Flon—Engines and crews of the HBM&S using CN Rail tracks between Mileage 85.5 and 87.7 will be governed by CN Rail, time table, rules and regulations.

2.4 Regulations for the Protection of Track Units and Maintenance Work
Sections 10.0 and 11.0 applicable between Flin Flon Jct. and Channing.

3 EQUIPMENT RESTRICTIONS

Unless authorization received from Office of General Supt. Transportation, the following will apply:

3.1 Units in series 2000-2399 and 5000-5399 prohibited. Maximum permissible speed units in series 5500-5610 and 9400-9667 between:

Mileage 0.0 and Mileage 50.6 40 m.p.h.

Mileage 50.6 and Mileage 65.8 20 m.p.h.

These units are prohibited between siding south switch Athapap and Flin Flon.

3.2 Heaviest car permitted (including contents):
263,000 lbs.

4 SPEEDS

4.1 Mileage

8.0 to 50.6 Zone

8.1 to 8.4

39.1 to 39.4

50.6 to 70.8 Zone

70.8 to 82.0 Zone

72.3 (Over bridge)

72.7 (Over bridge)

81.3 (Over bridge)

82.0 to 87.5 Zone

MILES
PER HOUR
All Trains

50

40

40

25

20

10

10

10

10

5 PUBLIC CROSSINGS AT GRADE

5.1 Mileage 83.5 (Highway 10)

To avoid delay to highway traffic, switching movements within 800 feet of crossing must operate control device located on case at crossing to STOP. When ready to proceed operate control device to START.

5.2 Mileage 87.5 (Main St.)

(First crossing south of Flin Flon station.)

Movements must stop clear of crossing and movements over crossing must be protected by a member of the crew.

6 SPURS AND OTHER TRACKS

6.1 Prospector PH FN 04-05

Mileage 4.4—Extends west of track. Points face south. Capacity 1130 feet. Only empty cars may be placed on this track.

Maximum permissible speed—10 m.p.h.

6.2 Root Lake Gravel PH FN 15

Mileage 12.3—Extends 4.3 miles west of track off tail of wye.

6.3 Pit Spur FN 48-49A-50

Mileage 61.0—Extends west of track. Points face south. Capacity 3800 feet.

6.4 Runaround Track FN 47

Mileage 61.0—Extends east of track. Connected both ends. Capacity 3430 feet.

Public Crossings.
at Flin Flon
5.2 would make a
one man crew impossible
at this time.

APPENDIX II-a

CHART I

Day Trips to Thompson Originating in
Thicket Portage and Pikwitonei

Reason	From: Thicket Portage		From: Pikwitonei	
	Annual	Per Day (3 trips/wk.)	Annual	Per Day (3 trips/wk.)
<u>Health & S.S.</u>				
Medical Visits	2200/yr.	15	1800	12
<u>Northern Affairs</u>				
Conferences, Meetings	Surratil	1		1
<u>Frontier</u>				
Principals'	1/mon.)	1/2	1/mon.)	1/2
In-service, etc.	12/year)		12/year)	
Class or charter	20 once/yr.		20 once/yr.	
<u>Resident</u>				
Shopping Assume 2% of population		5		5
<u>Other Agencies</u>		1		1
		—		—
Minimum Total:		20+		17+

NOTE:

The above is identified minimum and base load. Stretcher cases (total 24 per year from each community) occupy three seats and only one is considered in the above. Nor does the vacation or beyond Thompson travel and is far short of the 40 per trip community estimate.

CHART II

Day Trips Originating in Thompson to
Thicket Portage and Pikwitonei

Reason	To Thicket Portage	To Pikwitonei
Health & S.S.	1	1
Northern Affairs	1	1
Frontier	1	1
Other Agencies	2	2
Total:	5	5

NOTE:

There is additional suratic travel which is not estimated.

CHART III

APPENDIX II-b

Locations of Agency Administration Centres
and Communities Serviced by the Centre

Agency	Location of Administration Centre	Communities Serviced by Administration Centre
Indian Affairs (federal)	Thompson) The Pas) Winnipeg)	Pukatawagon, Bay Line
Northern Affairs	Thompson The Pas	Thicket Portage, Pikwitonei, Ilford, Sherridon
Medical Services	Thompson Flin Flon	Thicket Portage, Pikwitonei, Ilford, Sherridon
Frontier School Division	Thompson The Pas	Thicket Portage, Pikwitonei, Ilford, Sherridon
RCMP	Thompson	Thicket, Pikwitonei, Ilford
DREE, LEAP	Thompson	Thicket, Pikwitonei, Ilford
Housing (federal)	Thompson The Pas	
Parole Services	Thompson	All

Community Meeting
At

School Gym

TUESDAY - DEC 28th

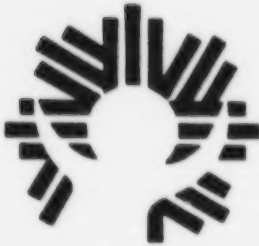
1-O'clock P.M

Topic - Rail bus

SERVICE BETWEEN
Thompson-Thicket
Portage + Pikwitonei

MR. Mike Babulic

SPEAKER



FRONTIER SCHOOL DIVISION NO.48

AREA 1 OFFICE

January 4, 1983

Mr. Mike Babulic
228 Riverside Dr.
THOMPSON, Manitoba

Dear Mr. Babulic:

Further to our meeting of December 15, I am forwarding to you information concerning employees of Frontier School Division who travel to and from the communities of Pikwitonei and Thicket Portage on Frontier School Division business.

The nature and frequency of travel will differ depending upon the particular assignment of the individuals involved. There are three basic group of Frontier Division personnel travelling to the two communities.

- 1) Area office administrative and consulting personnel. (7 people)
- 2) Teachers, teacher aides and local school committee personnel. (10 people)
- 3) Winnipeg office personnel. (10 people)

These groups are listed in descending order of travel frequency.

At the area 1 office, administrative and consulting personnel travel to the two communities involved approximately once every two months. This travel is generally done by Via Rail but occasionally, due to schedule inconveniences, air charters are arranged. The type and amount of service which we are able to offer to these two communities is limited by virtue of difficulties in transportation schedules. The area 1 maintenance person working out of the Thompson office, travels much more frequently to Thicket Portage. Because of the urgent nature of his work, he is occasionally required to arrange air charters.

There is a total of 6 qualified teachers and 3 teacher aides in the communities of Pikwitonei and Thicket Portage. These teachers are required to travel to Thompson on Frontier School Division business on an average of once per month. In addition they make efforts to come to Thompson for personal reasons when schedules permit. In one community it was necessary to adjust the length of the school day to permit the teachers at least one shopping trip to Thompson per month. This arrangement, although necessary, is inconvenient to all concerned. In addition to the employees of Frontier School Division, locally elected school committee members travel to Thompson on the average of three times a year for various meetings. Once again it is often necessary to schedule our meetings around the existing Via Rail passenger service.

./2

- 2 -

There are approximately 10 employees of Frontier School Division who work out of our Winnipeg office and are required to visit Pikwitonei and Thicket Portage. The program consultants can be expected to make an average of two trips per year into the communities in question. Maintenance personnel travel more frequently, particularly during periods when major or minor capital projects are underway in these communities. Charters are frequently arranged in order to facilitate travel connections to and from Winnipeg.

As you can see from the above there is considerable travel in and out of Pikwitonei and Thicket Portage by Frontier School Division employees. Under the current Via Rail system this travel is inconvenient and limited. Where travel cannot be accommodated by existing schedules, expensive air charters are required. The net result of the present situation is service limitation and unreasonably high costs.

In the interest of providing cost effective services to the the two communities involved a daily rail bus leaving Thompson at approximately 8:30 a.m. and returning at approximately 4:30 p.m. would be ideal for Frontier School Division personnel. On behalf of the division I support you in your investigation into improved rail service into the communities of Pikwitonei and Thicket Portage.

Yours truly,


J.B. MacNeil
Area Superintendent

JBMac/sm

cc: T. Pysh

PIKWITONEI COMMUNITY COUNCIL
.....

PIKWITONEI, MANITOBA
R0B 1E0
Phone: 458-2420

January 11, 1983

Mr. J. Babulic
228 Riverside Drive
Thompson, Manitoba
R8N 0X2

Dear Mr. Babulic:

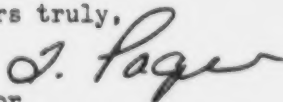
RE: RAIL BUS SERVICE

After speaking with a majority of people from the community, should there be a rail bus service in operation between Pikwitonei and Thompson, the following services are requested.

A forty seat passenger bus with a three day a week service on the following days- Tuesday, Thursday and Saturday with a schedule time of leaving Pikwitonei for Thompson at 9 AM - returning to Pikwitonei at 5 PM and include freight service both ways, also option to charter bus any given day.

Hopefully this will help in putting together your proposal.

Yours truly,


Mayor

MANITOBA

DEPARTMENT OF NORTHERN AFFAIRS

Local Government Services
Box 27, 59 Elizabeth Drive
Thompson, Manitoba
R8N 1X4

February 3, 1983

Mr. M. J. Babulic
228 Riverside Drive
Thompson, Manitoba
R8N 0X2

Dear Mr. Babulic:

Per your request for information on utilization of proposed rail bus by departmental staff:

Presently, as Local Government Co-ordinator, I am required to attend a minimum of one community council meeting per month, per community. In addition to meetings, I conduct yearly municipal elections; go to the communities for training of councillors, mayors and clerks; present audits; monitor job creation projects; and act as a liaison between the community and outside agencies.

Community Works Section is required to carry out or supervise all capital works projects and maintain current services, such as chlorinated water systems. Trades people are also sent to the communities for emergency repairs and maintenance. Communities have a number of capital projects each year ranging all the way from smaller projects, ie. dock repair, to projects such as firehall construction.

. . . . 2
February 3, 1983
Mr. M.J. Babulic

Technical Services - Provide Engineering and management expertise in such areas as feasibility studies, drafting, inspection and planning. Their staff include training personnel for the water chlorination systems, draftsmen, an engineer, etc.. Personnel from this section are required to travel to the communities on a less frequent basis and are presently utilizing Government Air almost exclusively.

Municipal Government Support - Function as a support group and provide training material, community reports, election materials, etc.. Some travel to communities is required.

Administrative Support - Financial management Tax Section, Audit personnel. Majority of travelling in this section would be by the auditor and his assistant for yearly and interim audits.

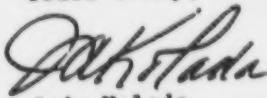
Presently, nearly all Northern Affairs employees travelling to Thicket Portage and Pikwitonei find it more feasible to utilize Via one way and Government Air the other. Exclusive use of Via would necessitate us spending a number of days in the community while our present policy is to go into a community by Government Air allowing ourselves the required time before train time out.

Staff are required to travel by the most economical methods. Currently, some travel is restricted due to restraints. Therefore, if a rail bus service were initiated, I would foresee an increase in rail travel. This not only because a rail bus would be far less costly than charter aircrafts, but related expenses, such as employee expense accounts would be reduced in proportion to the length of time spent in the communities.

I would hope that a rail bus could be made available for charter service. Our Department brings community people into Thompson for meetings from time to time and this mode of travel would be more economical than air charter.

This system should also be available for medivacs or emergency use.

Yours truly,



Judy Kolada
Co-ordinator

JK/is

cc: Dave Prowse
Regional Director
Local Government Services

Thurs 1200

Ian Henderson
Waterworks Engineer
Works and Operation Division
Waterworks, Waste & Disposal Div.
City of Winnipeg
1500 Plessier Rd
Transcona

237 4203

3:00

Warner Martin
Exec VP & General Manager
Motor Coach Industries
1149 St Matthews (at Wall St).
Winnipeg

786 - 3303.

Fri. 0900

Mr Ochitwa
Proprietor
Winnipeg Coach Sales & Service
1005 William Ave
Winnipeg 786-8819

Mr Bert Luckhurst
Consultant of Resource Development
947-0318 - is the contact & will be there

led.

130

Ben Sabourin
Superior Industries
Morris Man

746 2333

(Call Tues afternoon to confirm -
if he is not available
then Sabourin, Sales Mgr
will be available).

T. Fells

0900

Bernie Thiesen
Gray Goose Bus Lines
301 Burnell St
Winnipeg

786-2891

1100

Quinton Mc Naught
General Superintendent
Winnipeg Hydro
1315 Notre Dame
Winnipeg (2nd floor)

946 0327

Jack Crawley
Asst Gen Mgr & Chief Engr
also there.

4.00 pm

Flyer Industries.

APPENDIX III-b



WINNIPEG HYDRO

MR. K.H. HALLSON, P. ENG
GENERAL MANAGER
5TH FLOOR ADMINISTRATION BLDG
CIVIC CENTRE
WINNIPEG, MANITOBA R3B 1C1
TELEPHONE 946-1100

File: TW 31-3

1983 01 14

Dept. of Highways & Transportation,
Transportation Division,
15th Floor, 215 Garry Street,
Winnipeg, Manitoba
R3C 3Z1

Attention: Mr. W. Graham,
Manager, Passenger Policy Branch

Dear Wes:

I hope the enclosed drawings of the wheels, etc. for our
"School Bus" LRV will be of some use to you.

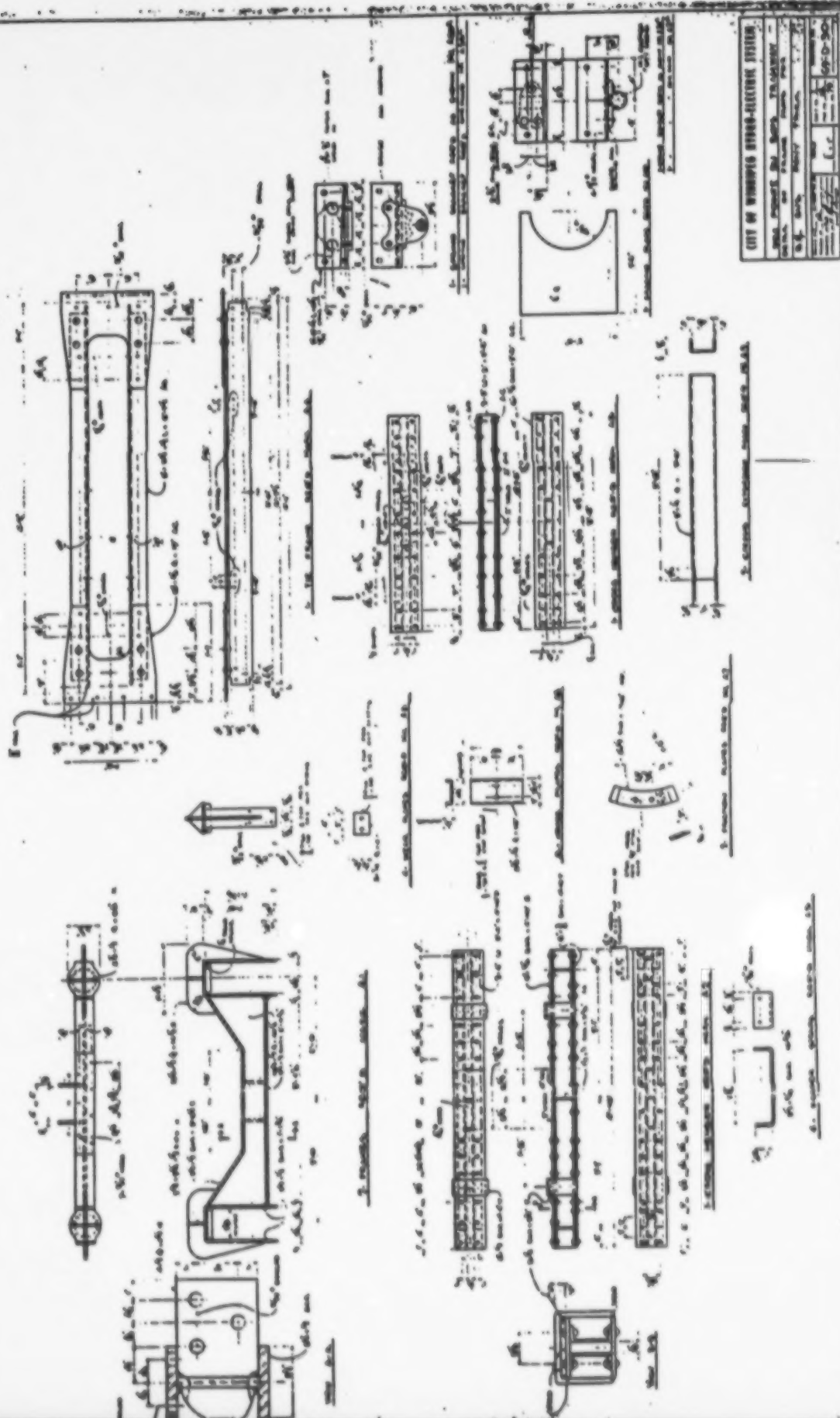
We have been unable to find any further information in our
files. If they do come to light, I will send them on to you.

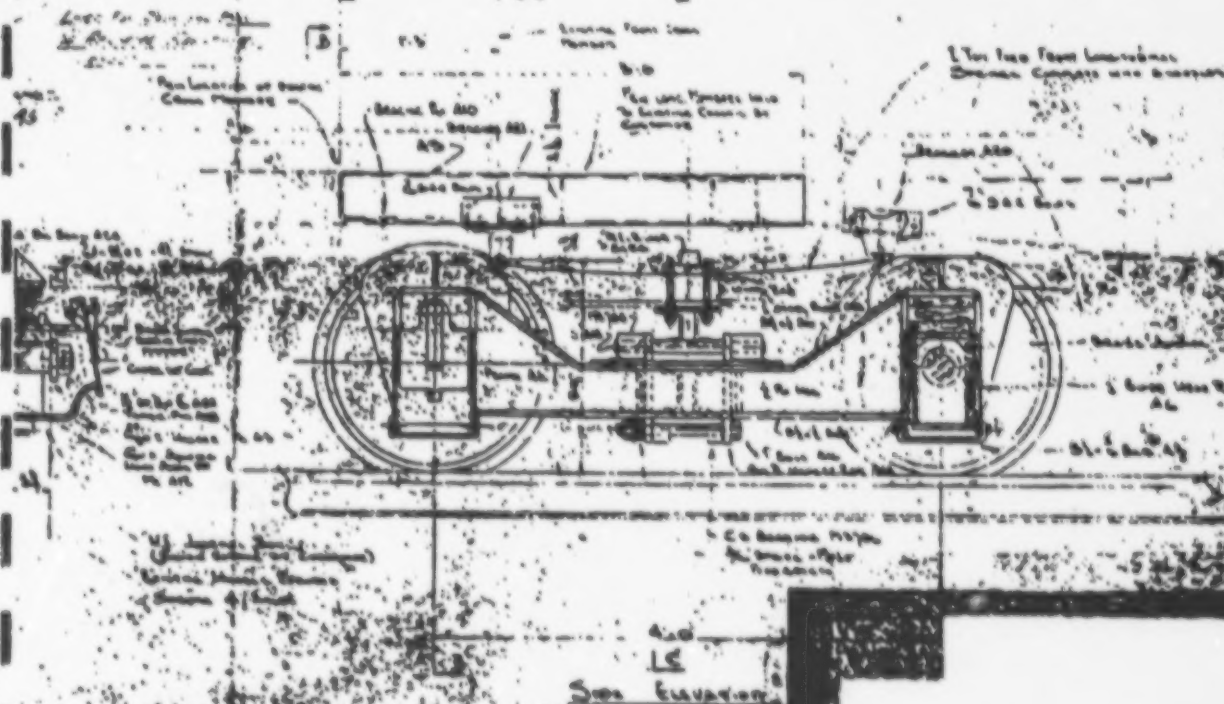
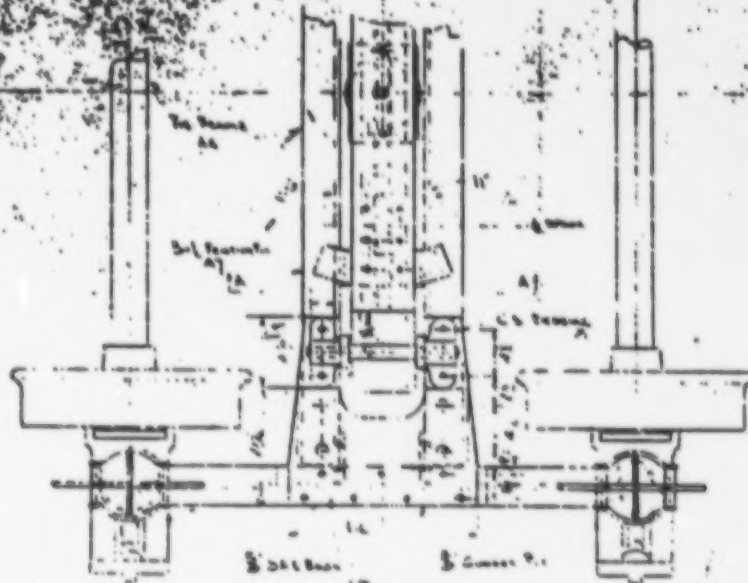
Yours truly,

Q. E. McNaught, P. Eng.,
Gen. Supt. - Production Branch

QMcn/cl

Encl.





CITY OF WINNIPEG HYDRO-ELECTRIC SYSTEM

TITLE
POINTE DU BOIS TRAMWAY
84 BUS PONT TAVER
ASSEMBLY

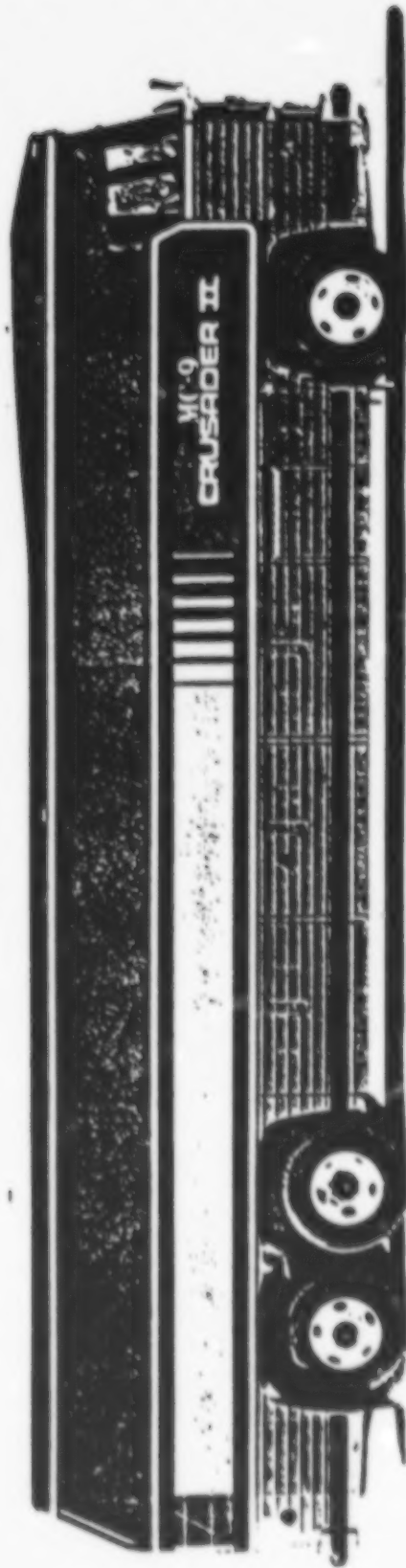
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MC-9 CRUISER II

CHARTER

CHARTER II





the GMC-CHEV CRUSADER II

SO far ahead, it's all alone

When the MC-8 Crusader was first introduced, we were convinced even then that it was the finest bus ever built for the intercity bus industry. Continuing in this tradition we present the MC-9 Crusader II.

Improving on the phenomenal record of dependable, trouble-free, economical operation posted by its predecessors, the MC-9 offers improvements for the passenger, maintenance man, driver and owner alike.

Seven large rectangular windows on each side provide greatly improved passenger visibility at all seat locations. Parcel racks have been redesigned to incorporate optional 110 V. fluorescent lighting, relocated reading lights, high quality speakers and pressure sensitive type passenger signal chime switches. Interior decor is new to further provide ultimate passenger appearance and comfort. Wood grain melamine lower side wall panels are standard.

All passenger side windows are fully interchangeable. As non-sliding windows are provided, a roof emergency ventilation system is standard.

Mechanical improvements include gear driven oil cooled alternator, axial flow type air conditioner condenser fan, higher output air compressor to name a few. New full length side rubber rub rails are also provided.

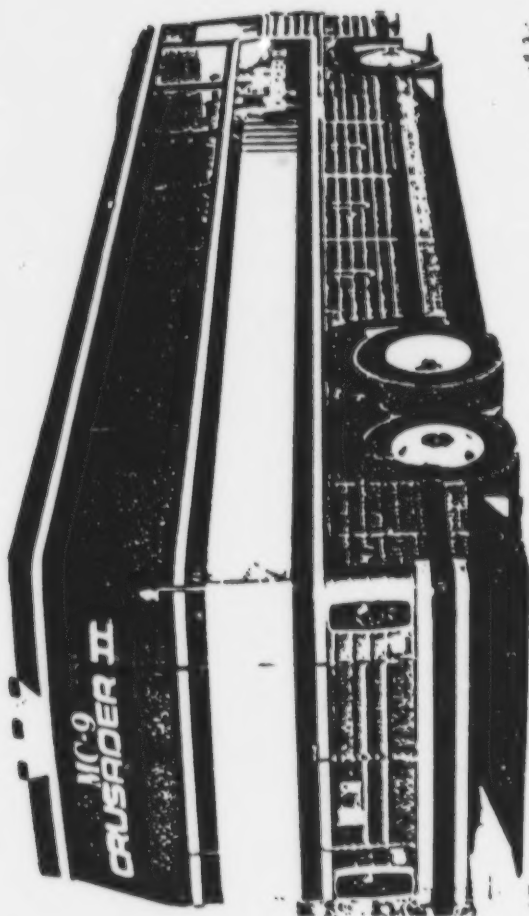
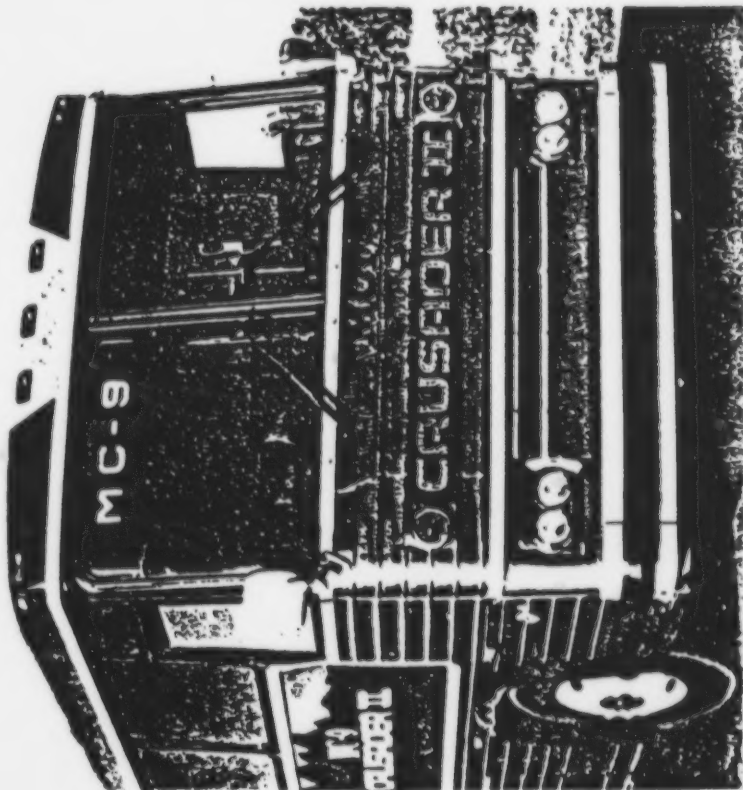
Our goal is to continue the long series of superior buses built by Motor Coach Industries, the largest manufacturer of intercity buses in North America.

The following pages provide all the pertinent detailed information you will need to fully evaluate the MC-9 Crusader II in light of your fleet requirements.

Our sales staff is available to answer any questions you might have or to provide any additional information you need to go MCI.

built for durability. safety...and lasting beauty

When you buy an MC-9 Crusader II for your fleet, you can be sure you have made an investment that will endure. The high resale values prove it. It has been designed and built so that even after hundreds of thousands of miles of service it is the same quiet-running, beautifully-styled bus it was the day it rolled out on its first trip.



Condensed Specifications

Body Construction

A welded single-piece frame of the "monocoque" type provides great strength and resistance to stress and minimizes rattles and squeaks for the life of the bus. Stainless steel is used in the construction of the lower frame exposed to road splash.

Exterior Paneling

Exterior center roof and sidewall panels immediately below passenger windows are high tensile, treated aluminum. Stainless steel, fluted paneling is used below passenger floor line on both sides and at the front and rear of the vehicle. Front roof cap and rear roof crown panels are molded fiberglass. Appearance moldings are either anodized aluminum or stainless steel.

Exterior Painting and Lettering

A coat of highly durable epoxy paint is applied in the colors of your choice. Standard exterior painting includes two colors on the roof and on the aluminum paneling below passenger windows. Standard lettering consists of operator's name painted on both sides or application of pressure-sensitive decals supplied by operator. Painting also includes coach numbers in up to five locations and certificate numbers on each side.

Insulation

Roof and sidewalls are insulated with 2" (51 mm) medium density, fiberglass, compressed during application of interior panels. Sidewall insulation is contained in waterproof envelopes. High density fiberglass with an asbestos blanket is used for insulation and sound-deadening at rear bulkhead. Double floor construction over axles is filled with insulating material to reduce the transfer of heat, cold and tire noise to the inside of the coach.

Rear Window Area

A large, one-piece, color impregnated, reinforced fiberglass panel, $\frac{1}{8}$ " (3.0 mm) thick, riveted to the main structure is used in lieu of rear window glass. Panel is insulated with 2" (51 mm) thick medium density fiberglass. A $\frac{1}{4}$ " (19 mm) thick firm density fiberglass blanket is also cemented to the panel.

Bumpers

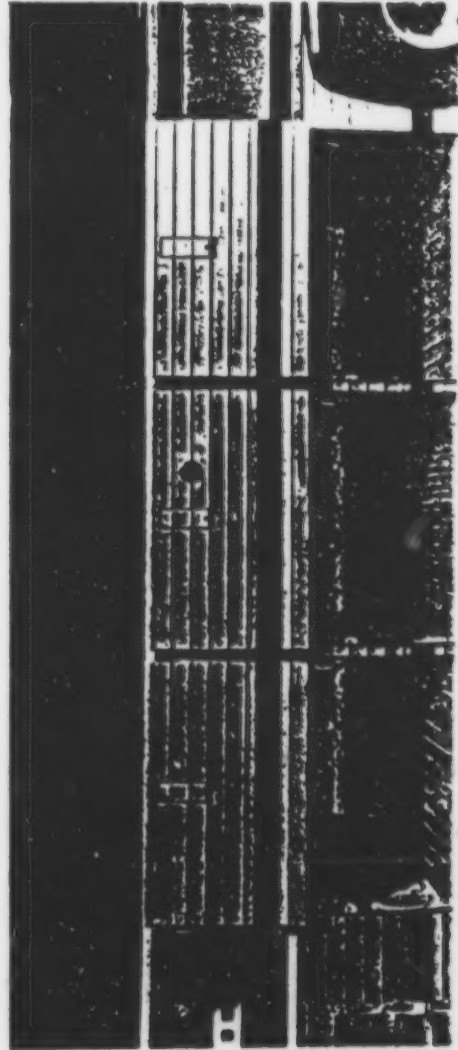
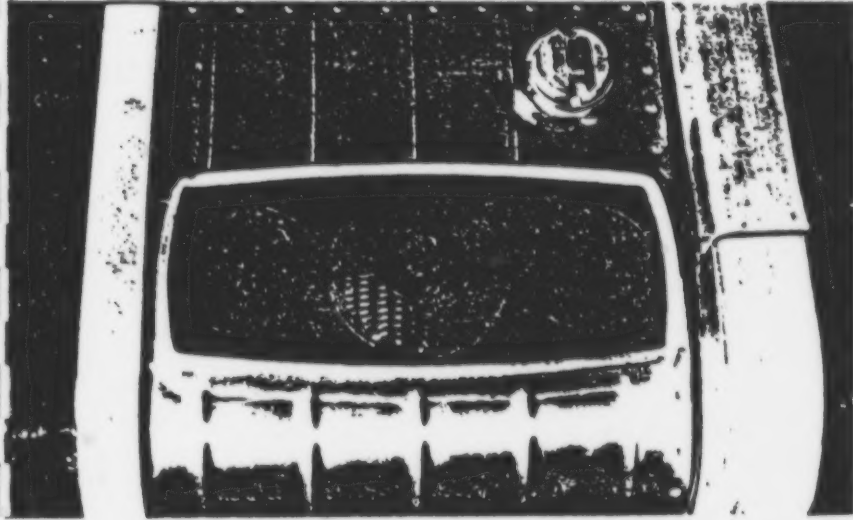
Front and rear bumpers are made of 12" (305 mm) wide, extruded, hard alloy anodized aluminum, back-ribbed for maximum strength. Front bumper is hinged at the top for easy access to spare tire compartment.

Baggage Compartments

Three (3) full-width, underfloor compartments are provided between front and rear drive axles. Total capacity is 300 cubic feet (8.5 m³) with a clear 33" x 54½" (840 mm x 1380 mm) opening provided to each compartment on both sides of coach. All compartment doors are fully sealed, pantograph, vertical lift type, and each has a flush mounted breakaway-type latch handle with provision for padlock and custom seals. All doors are interchangeable.

Destination Sign

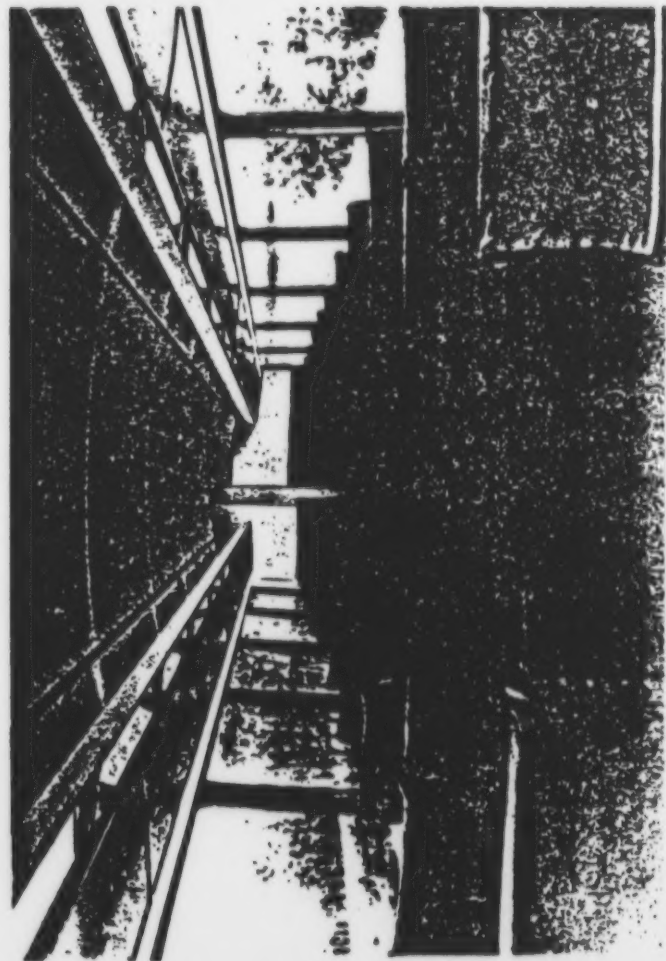
Located immediately behind upper portion of right hand windshield, standard destination sign provides 25 exposures with 4½" (115mm) high letters.



an interior designed for passenger appeal... and comfort

Passenger opinion of your service is strongly influenced by the design and decor of the bus' interior, because that's where they spend most of their time.

Here again, the MC-9 Crusader II is in a class by itself. Add your own selection of interior color to the deep-cushioned reclining seats, the large tinted picture windows, spacious overhead racks, a floor covering that makes movement around the coach easy and safe, an optional fully-equipped stainless steel restroom and the many other outstanding features of the MC-9's interior, and you have provided the ultimate in relaxed riding comfort that will make the miles and hours of travel slip by quickly for your passengers.



condensed specifications

Stepwell

The entrance stepwell is of the four-step type and is constructed entirely of stainless steel. All corners are covered for ease of cleaning. Step plates have .312" (8.0 mm) ribbed rubber treads. All step edges have stainless steel nose caps.

Passenger Seating

Standard passenger seating consists of 22 forward-facing 2-passenger recliner seats, and a 5-passenger rear cross seat. All two passenger seats are full 38" wide. See pages 12 and 13 for two of the different seating floor plans available in the MC-9 Crusader II. Seats are track mounted to facilitate rapid changing of seating plans to suit operator's requirements. A number of different fabric colors are available.

Sash

Fixed-type, safety push-out passenger sash are installed, seven on each side. Frames are black anodized aluminum. Sash are hinged at the top and retained at the lower edge with positive bolt-type catches. A single-motion release bar permits rapid opening of windows for use as emergency escape exits. Operating instructions are clearly visible at each seat location. The sash meets Federal Motor Vehicle Regulations. All seven sash on each side are interchangeable. Approximate size 27" x 51 5".

Sash Glazing

Passenger side windows are uniform grey tint single glazed with laminated shatter-proof heat-absorbing glass. Entrance door and driver's window are single glazed safety glass.

Interior Parcel Racks

Overhead panel-type interior package racks provide approximately 122 cubic feet of storage space. The edges of the parcel racks are anodized aluminum extrusions.

Floor and Floor Covering

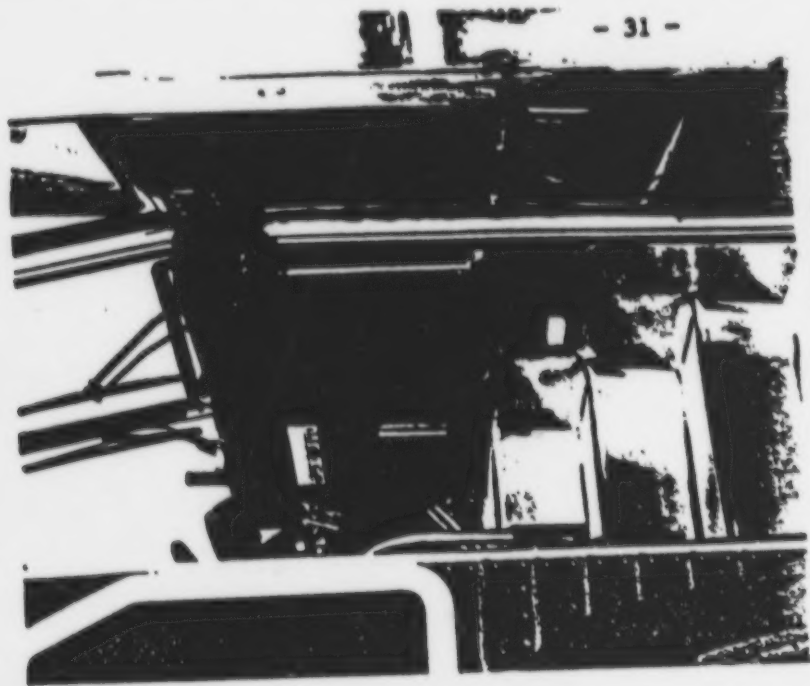
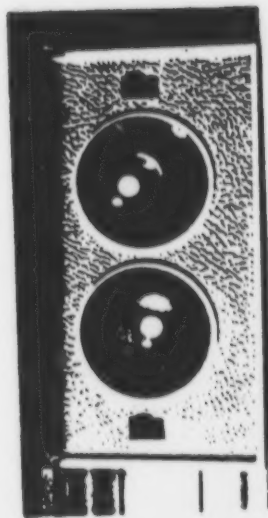
The passenger floor is flat throughout except for a ramped aisle section between the first three rows of seats. The entrance area, driver's area and front of ramped aisle area are all on the same level. The entire passenger floor area and driver's area are covered with .125" (3 mm) smooth rubber flooring. The ramped aisle area and entrance area are covered with .187" (5 mm) ribbed rubber flooring.

Interior Finish

Interior ceiling panels and parcel rack are covered with a coated vinyl. Sidewall covering below the passenger windows is melamine. Front dash is covered in permanent finish vinyl material. Longitudinal air ducts and moldings are stainless steel.

Lighting

Reading lights are provided for each passenger position except center position of rear cross seat. Lights are individually controlled and are pre-focused for each position. Lamps are track mounted in housings on aisle side of parcel rack and are easily relocated for various sealing configurations. Improved indirect lighting is provided in parcel rack supports and in continuous strip under parcel rack at wall side. Two blue running lights are located at the extreme rear of the parcel rack. Six seat mounted aisle lights are provided for passenger safety and convenience.



a ride unmatched for smoothness, comfort...and safety

The riding qualities of the MC-9 result from much more than just its state-of-the-art suspension. A fully integrated system of suspension, shock absorbers, brakes, wheels, tires and steering makes the Crusader II totally responsive to the expert control of your drivers under all conditions, and allows them to provide your passengers with a ride that cannot be equalled by any other intercity bus on the road today.



Air-ride suspension is a feature of the Crusader II.

condensed specifications

Air Suspension

The MC-9 air suspension system is the result of continuous improvement of a suspension system first introduced more than 25 years ago. Two main bogie assemblies, one for the front and one for the rear drive axle are attached to the body structure and incorporate air beams. Double convoluted air bellows are provided between air beams and axles. Four 9-inch (230 mm) bellows at the rear drive axle and four 12-inch (305 mm) bellows at the front axle. Front and rear axle alignment is maintained by four radius rods with a fifth transverse stabilizing rod at the front axle. Radius rod ends are mounted on heavy duty rubber bushings. Delay type height control valves, one at the front and two at the rear, are used to vary air pressure in the bellows to keep the body at the correct height and in level position regardless of vehicle loading. Rear trailing wheel suspension uses one rolling lobe type bellows per side, and pivots independently on trunnions, allowing independent movement. A pressure control valve maintains constant loading on each trailing axle under all conditions, automatically relieving pressure in case of overloading.

Shock Absorbers

Eight double acting, telescopic type heavy duty shock absorbers are provided: one at each side of front axle, two at each side of rear drive axle, and one at each trailing axle swing arm. All are completely interchangeable.

Service Brakes

Air-operated two-shoe service brakes are installed at each axle. Front and rear trailing wheel brakes are operated by clamp-type brake chambers through slack adjusters and camshafts. Rear driving axle brakes are operated by combined service and parking brake chambers through slack adjusters and camshafts. Front and rear trailing wheel brake size is 14½" x 5" (368 mm x 127 mm). Rear drive wheel size is 14½" x 8" (368 mm x 203 mm). Total effective brake shoe area is 1,058 sq. in. (682,600 mm²). The brake system conforms to all applicable current vehicle regulations.

Trailing axle acts as main stabilizer for positive tracking of coach; also assists in carrying heavy loads, and provides added braking power and safety.

Emergency Brakes

Air-operated DD-3 emergency brake chambers are mounted at the rear driving axle. The system is provided with an isolated air supply.

Air System

The air compressor is a Bendix-Westinghouse, two cylinder, water cooled "Tu-Flo 700" unit that is gear-driven and lubricated from the engine. A "ping" tank is installed in the air compressor discharge line. Four air reservoirs are used and all are readily accessible for draining. Air to the service brakes is supplied from the No. 2 tank, which is protected by a check valve so that the brake system is isolated from other components. Air for air-operated accessories and the suspension system is supplied from the No. 3 air tank. Air for parking and emergency brakes is contained in a separate reservoir (No. 4) protected by a check valve so pressure is maintained even in the event of an air loss in the main system. Air lines and accessories are securely clipped and protected from scuffing and road splash. Low air pressure warning is by means of a buzzer and signal light.

Wheels and Tires

Ten-stud 22.5 x 8.25 Firestone Extra Service Wheels are used with drop-center rims for 12.0 or 12.75 x 22.5 radial or conventional tubeless tires. All wheels and tires are completely interchangeable. Nine wheels including spare are provided.

Power Steering

A hydraulic power steering system is a standard feature on the MC-9 Crusader II. A hydraulic assist booster cylinder is controlled by a valve in the manual steering gear to provide effortless control and still maintain the essential "road feel" for the driver. The power steering is a fail-safe system with the manual steering system always operative.



Styled front wheel fenders ward off mud and reduce buildup of moisture on mirrors and sides



The secret of the MC-9's excellent road stability is its independently mounted rear trailing wheels

designed with your drivers in mind

The quality of your service ultimately depends on how well your drivers perform. Every stage of engineering and design of the MC-8 Crusader II was accomplished with the driver in mind to determine those things that would help him most to operate his bus safely and efficiently at all times under all conditions.

The Crusader II offers the driver a commanding view from virtually every angle through an exceptionally large windshield that wraps around for even greater visibility.

Large, heavy-duty wipers clear a large portion of the windshield and are designed to stay flat on the glass even at maximum highway speeds.

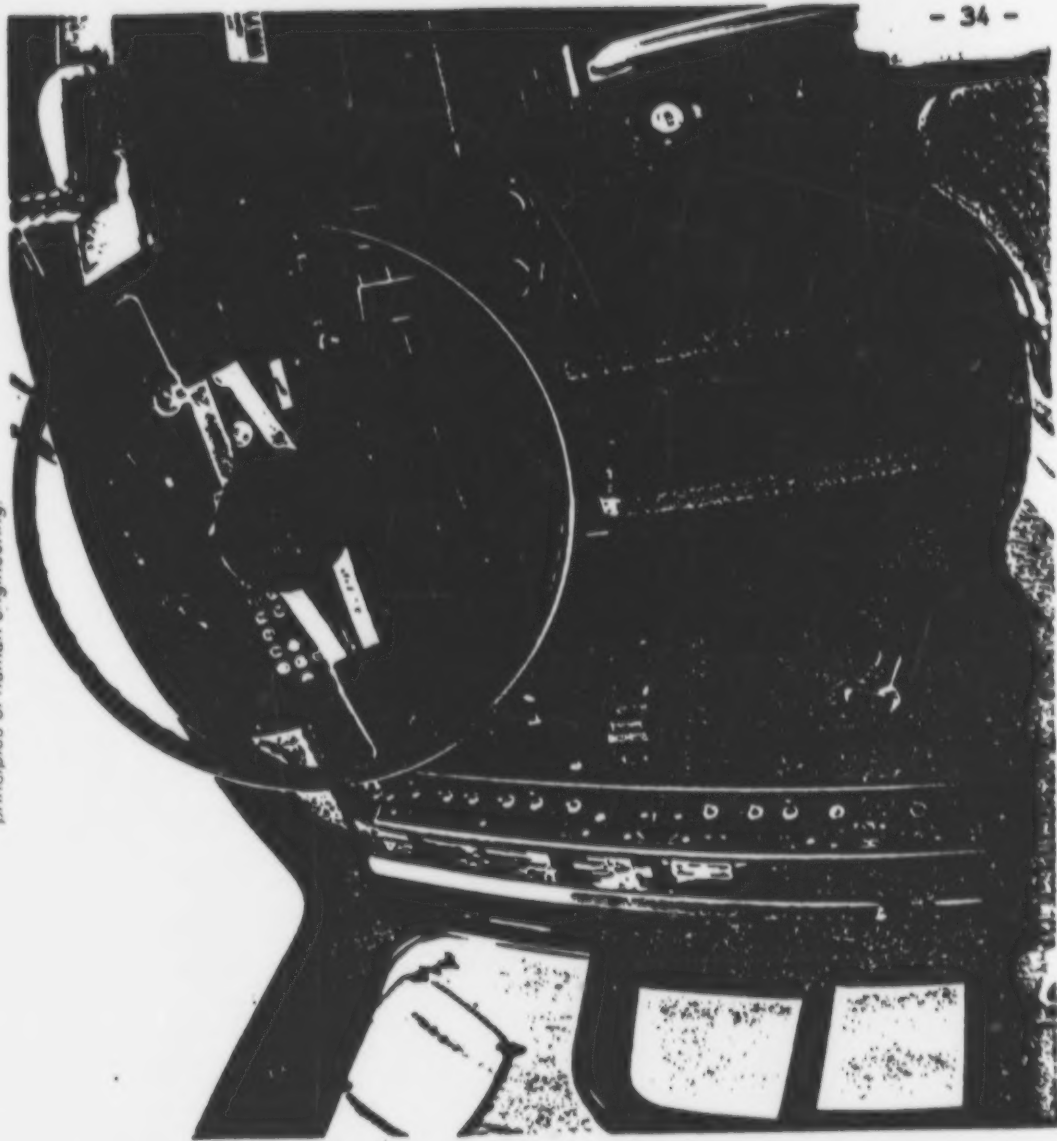
Using principles of human engineering, all essential controls are located in the most natural positions. All important instruments are directly in front of the driver, and the distance between controls is minimal so driver can keep his eyes on the road and hands on the wheel.

Audible emergency warning devices are used whenever possible to reduce visual scanning of instruments. And non-glare materials are used on all surfaces in the driver's area.

The standard hydraulic power steering helps fight driver fatigue as does an air-assisted release mechanism that reduces pedal effort on the clutch used with the four-speed manual transmission.

And, of course, the separate front-zone air conditioning system (see page 11) gives the driver complete climate control in his area. The separate heating and defrosting system provides complete comfort in cold weather and keeps the windshield frost-free under extreme cold weather conditions.

Position of instruments and controls in driver's area was guided by principles of human engineering.



condensed specifications

Entrance Door

A manually operated sedan-type entrance door is provided ahead of front axle on right side of coach. A lever on top of dash convenient to driver provides over-center control for both open and closed positions. Positive, automatic air lock with overrule is also provided. Plunger release with provision for pedlock is provided at front of coach below windshield to release door from outside of coach. A bi-parting type entrance door is also available as optional equipment.

Windshield

A large slanted two-piece curved windshield is provided. Windshields are interchangeable left to right. Each windshield measures 44" x 38 3/4".

Windshield Wipers and Washers

Two heavy-duty Sprague "Super Challenger" windshield wipers are provided. Wiper motors may be serviced from exterior of coach. Arms are pantograph type and have a black non-glare finish. An air-operated windshield washer with a one gallon reservoir is provided.

Sun Visor

A padded sun visor is provided for left hand windshield.

Rear View Mirrors

Exterior rear view mirror arms, brackets and heads are anodized aluminum. Mirror heads are nominal 8 1/2" x 8 1/2" (215 mm x 215 mm). A 3" (76 mm) round convex mirror is installed on the R.H. mirror assembly. An adjustable 6" x 12" (150 mm x 305 mm) interior rear view mirror is installed above the windshield header and provides a full view of the coach interior.



Large, slanted two-piece curved windshield provides driver with good visibility to rear of bus.



Large and clear visibility to rear characteristic of the MC-9

efficiently cooled, heated or ventilated for maximum passenger comfort...year 'round

Perhaps no other feature of a bus receives more comment — or criticism — than its heating and air conditioning system. With MC-9 Crusader II's in your fleet, the comments will all be favorable because our system is so efficient it will maintain the temperature inside the coach in the low 70's, even when the outside temperature edges above the 100° mark. And you'll appreciate the system's reliability and ease of maintenance.

MODEL MC-9 CRUSADER II AIR CONDITIONING SYSTEM



Condenser specifications

Heating, Ventilating, and Air Conditioning

The main underfloor heating and air conditioning system is integrated to the maximum extent possible. In addition a complete front dash, defroster, and driver's air conditioning system is provided.

The total heating system is forced-air, hot water with 154,000 BTU (45,150 w) capacity. Air is circulated at 2,500 cfm (70.8 m³ min.) of air for heating, and 2,750 cfm (77.9 m³ min.) for air conditioning. The fan motor is 24 volt, heavy-duty 1½ horsepower (1.12 kw).

The main underfloor plenum includes the heater core and air conditioning evaporator. The standard system is two zone with an optional third zone available for extreme temperature areas.

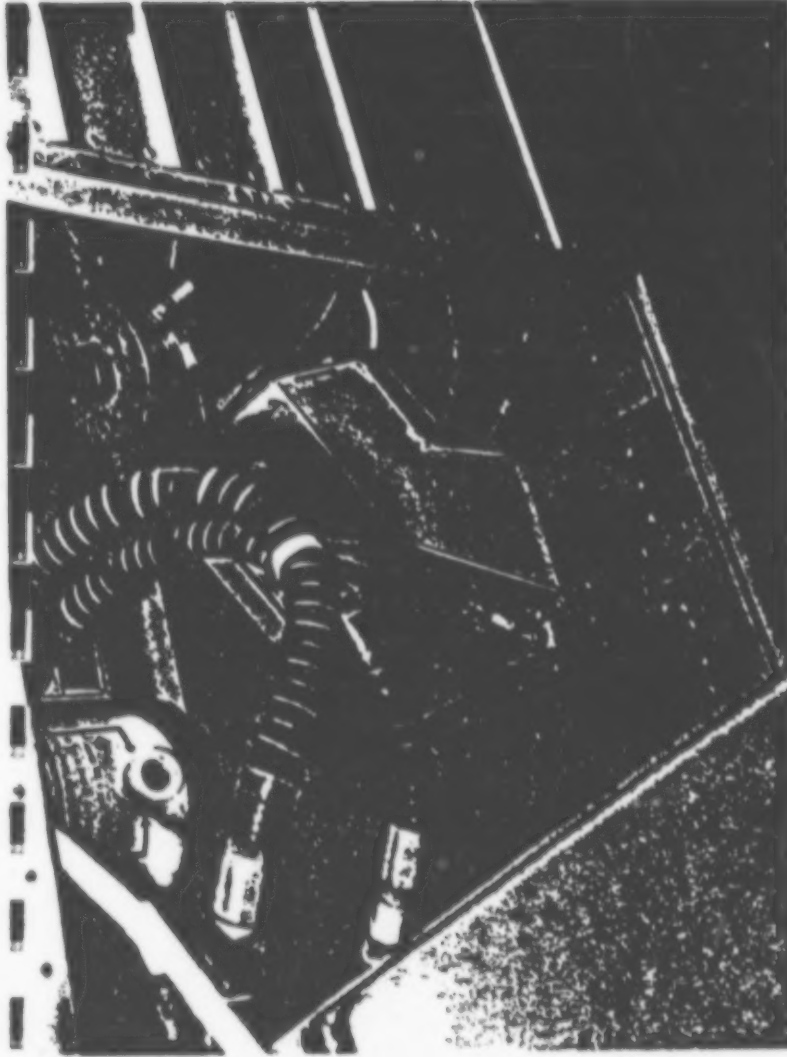
The front dash unit includes an air conditioning evaporator and defroster heater core. Fans are driven by two heavy-duty, ball bearing electric motors. The air flow is approximately 430 cfm (12.2 m³ min.) for the front dash unit. Full recirculated or fresh outside air is available for this system with manual damper control.

The front zone system works in conjunction with a "Hi-low" fan switch for the defroster with full manual controls available for the driver.

Main underfloor system provides 20% fresh outside air. All air is filtered prior to entering the plenum chamber. Air passes through the evaporator where it is chilled, and then over the heater core where it is warmed to the proper temperature before being forced into ducts which lead full length of the coach through longitudinal air ducts and up the side-wall to outlets at the base of the passenger windows.

Fully adjustable temperature controls are provided on the driver's panel and may be set to within 10° F (5.5° C) variance from a low of 68° F to a high of 78° F (20° C to 25.5° C).

Recirculated air is brought back to the main plenum chamber through return air ducts located at both front and rear of coach to provide nearly perfect balance.



New axial flow type air-

conditioning condenser fan and motor.

An optional third zone air conditioning unit is available which is located in the left rear parcel rack. The unit consists of an evaporator core, fan, and temperature sensor which function in conjunction with the main air conditioning system.

The MC-9 air conditioning system will maintain an interior temperature in the low 70's F (20° C) even when the outside temperature is over 100° F (38° C).

Two roof-mounted escape hatches are standard, one at front and one at rear. They are designed to also provide emergency ventilation through the coach, ram front and exhaust rear.

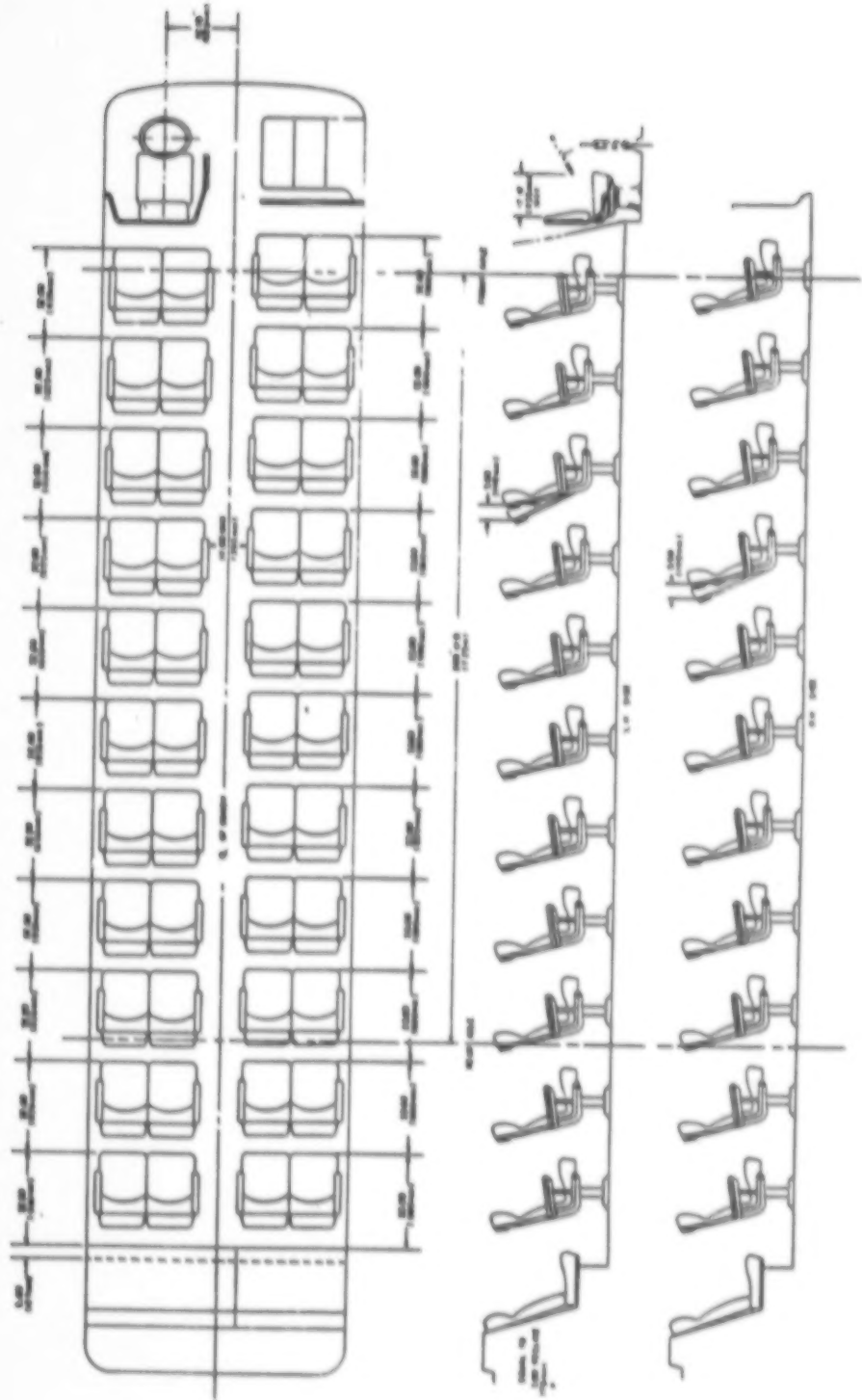
The refrigerant compressor is a Carrier, three-cylinder, fully unloading unit which is belt driven directly from the main engine by dual V belts. The unit does not require a clutch. An automatic air cylinder belt tightener maintains correct operating belt tension.

The refrigerant compressor has a patented MCI oil scavange system which prevents oil migration. This system has proven itself over millions of miles of operation.

Air conditioning condenser fan motor is two (2) H.P. (1.5kw) 24 volts, with shrouded axial flow fan. Blowers operate only when A/C is "on". Condenser, fan, motor, receiver tank, and filter dryer are mounted in compartment on left side of coach at rear of front wheelhousing. Condenser coil has copper tubes with aluminum frame.

seating arrangements to fit every requirement

The standard passenger seating arrangement on the MC-8 Crusader II consists of 22 forward-facing two-passenger recliner seats and a five-passenger rear cross seat. Actually there are six different seating floor plans available ranging from 43 seats with lavatory to 53 seats without a lavatory. Seats are track-mounted to facilitate rapid changing of seating plans.

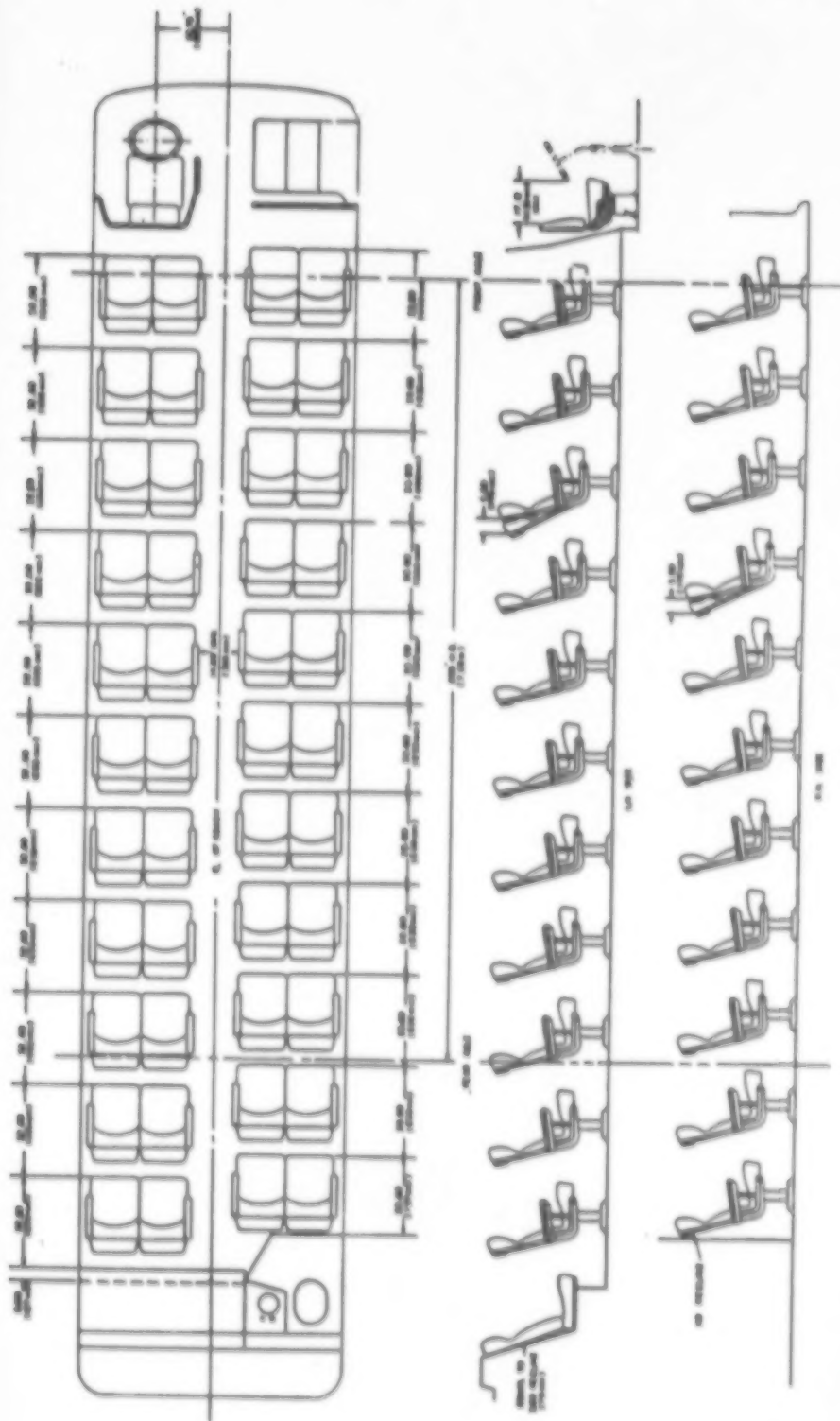


49

PASSENGER SEAT LAYOUT

47

PASSENGER SEAT LAYOUT (WITH LAVATORY)



powered for continuous trouble-free service... and economy

Like its gleaming, durable exterior, the power train of the MC-9 Crusader II has been engineered to more than meet the punishing demands of highway travel today... and tomorrow, too. With Detroit Diesel power the MC-9 is up to the grueling task of providing the dependable, maintenance free service day after day so essential to turning a profit in today's economy.

condensed specifications

Engine

The MC-9 Crusader II is powered by a rugged Detroit Diesel V-type, 2 cycle Diesel model 8V-71 engine developing 285 brake horsepower (212.5 kw) at 2,100 r.p.m., and a maximum torque of 803 foot-pounds (1,095 N-m) at 1,200 r.p.m. with 7E60 injectors. Compression ratio is 18.7 to 1. Bore and stroke is 4 1/8" x 5" (108 mm x 127mm). Piston displacement is 567.4 cu. in. (9,300 cm³). Engine, clutch, transmission and related components are mounted on a cradle for easy removal as a complete unit for major overhaul work. It is not necessary to remove engine from coach for clutch replacement. (A turbo charged 8V-71 TAE engine is required in California.)

Clutch

A Long 15-inch (381 mm) dry, double plate clutch is used with an air assist to reduce pedal effort. A special clutch adjusting mechanism located in the engine compartment, allows quick, simple adjustment without tools.

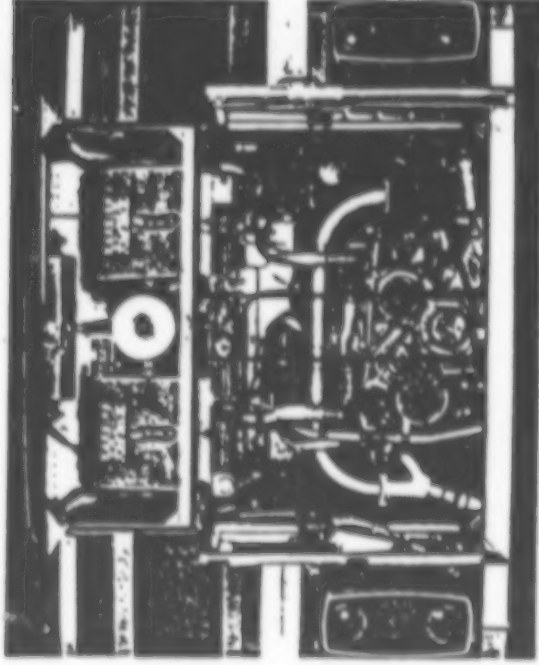
Transmission

The transmission is a Dana Model 8844A having torque capacity of 1,200 ft./lb. with four forward speeds and one reverse. Calculated road speeds at 2,100 engine r.p.m. and 12.5 x 22.5 tubeless tires in each transmission gear are:

GEAR	RATIO	SPEED M.P.H.	SPEED Km./Hr.
First	4.30-1	16.3	26.2
Second	2.33-1	30.0	48.3
Third	1.36-1	51.4	82.7
Fourth	1.00-1	70.0	112.7
Reverse	6.00-1		

Axles

The I beam front axle is a reverse Elliott type using tapered king pins, tapered roller wheel bearings and heavy duty tie-rod ends. The rear axle is a full floating type using hypoid gears with 3.70 to 1 ratio. Rear trailing axles are independently mounted behind the rear driving axle. The trailing axle brakes, hubs, bearings, seals and wheels are interchangeable with those of the front axle.



Easy engine access is provided through convenient doors. Center bumper section is removable for increased access. A blower compartment door above the engine provides quick access to blower gearbox, fan wheels, radiators and surge tank.



Detroit Diesel 8V-71 engine - 285 HP

engineered for safety

Unquestionably, safety is the most serious responsibility any bus operator has to face. And, to a great degree, the success he has in meeting that responsibility is directly related to the quality of the bus equipment he puts on the road.

The many safety features of the MC-9 Crusader II are covered in other parts of this brochure, but because of their importance some of them deserve further emphasis.

Foremost among Crusader II safety features is its remarkable stability. All possible factors affecting stability — length, width, height, total weight, wheel base, tire size, engine size, weight distribution, brake size and much more — were carefully engineered to produce a bus that not only stays solidly in contact with the road without noticeable sway, but also is totally responsive to the control of the driver at all times.

The Crusader II's independently-mounted rear trailing axle also adds to its roadability and results in both better braking and increased stability because of the greater contact with the road surface.

The side windows of the Crusader II are equipped with positive action bolt-type locks and are designed to stay closed unless intentionally opened by using the single-motion quick release bar. Operating instructions are plainly visible at each seat location.

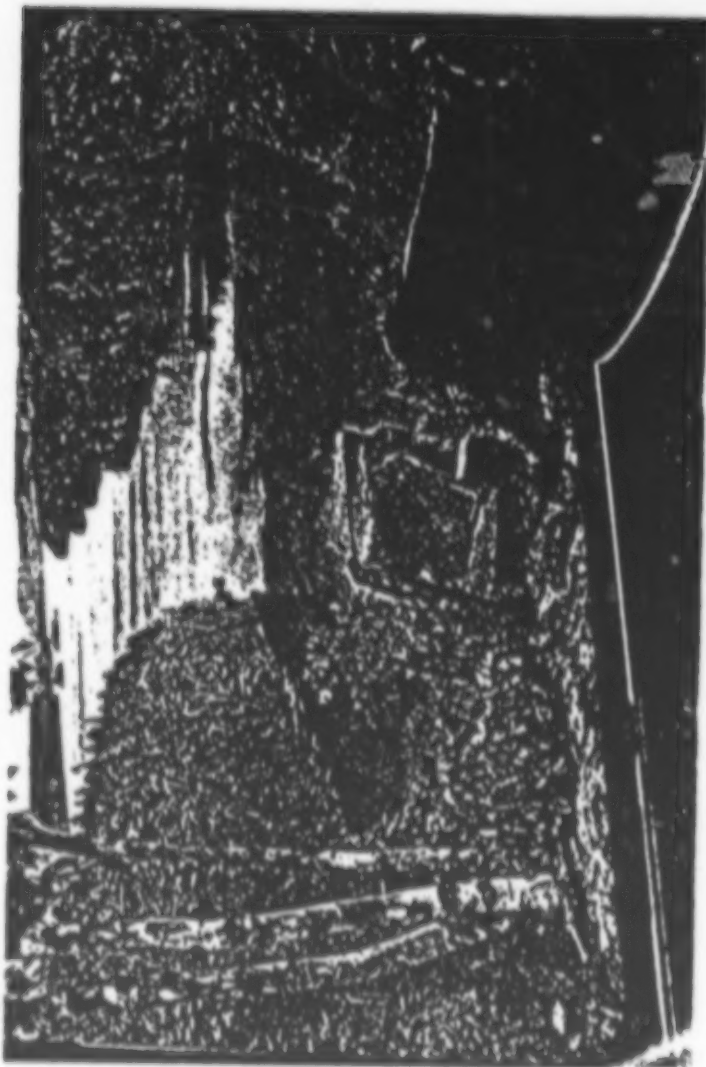
Two roof escape hatches, located at the front and rear of the coach, are opened by a simple, positive, pull-push quick release mechanism.

The specially designed ceiling of the MC-9 is another safety feature. Vinyl-clad aluminum panels are used that greatly reduce the possibility of sharp edges in the passenger area in the event of an accident. And, a secondary entrance door lock is a standard feature for operating safety.

Add to all this the strong, stress-resistant, single-unit construction of the MC-9 body, the use of durable alloy steel frame sections, stainless steel lower frame and side paneling, additional sidewall posts, increased number of roof bows, and you have a bus that is uniquely qualified to be rated as the safest intercity bus on the road today.

Crusader II also has 1 in. quick release roof escape hatches. Located in the front and rear of the coach, the hatches are actuated by a simple pull-push quick release mechanism.

All side windows pull out for easy exit in emergency.



other specifications

Cooling System

The cooling system uses two radiators mounted at the rear corners of the vehicle, at a height that minimizes the intake of road dirt or road salts.

Centrifugal blowers are mounted between the radiators and are enclosed in a sealed compartment. Air operated dampers automatically controlled by shutters regulate air flow through radiator cores as required to maintain correct engine temperature. With dampers closed and cooling not required, minimal engine power is used. A sight gauge is provided in the stainless steel surge tank.

Fuel Tank

A welded aluminum 144 gallon (545 l) fuel tank is mounted behind the front axle in an enclosed com-

partment. The filler neck is accessible through a separate service door on the right side of the vehicle. A scupper is provided to catch fuel overflow.

Electrical System

The electrical system is 24 volt negative ground. A 24-volt oil-cooled self-rectified alternator rated at 240 amperes is gear driven from the engine. A transistorized voltage regulator is used. Two heavy-duty 25-plate, 204 amp./hr. batteries are installed side by side in a ventilated compartment. A main battery shut off switch is provided above batteries. Wiring throughout the coach is assembled in loom-covered harnesses securely clipped with rubber grommets to prevent chafing. All wiring is color coded and metal tagged. The main junction panel left of driver is accessible through a hinged door

from outside the vehicle. Circuit breakers prevent overloading.

Lights

Dual sealed-beam head lamps are provided. Marker lamps, identification lamps, turn signal lamps, tail lamps and back-up lamps with acrylic lenses are provided.

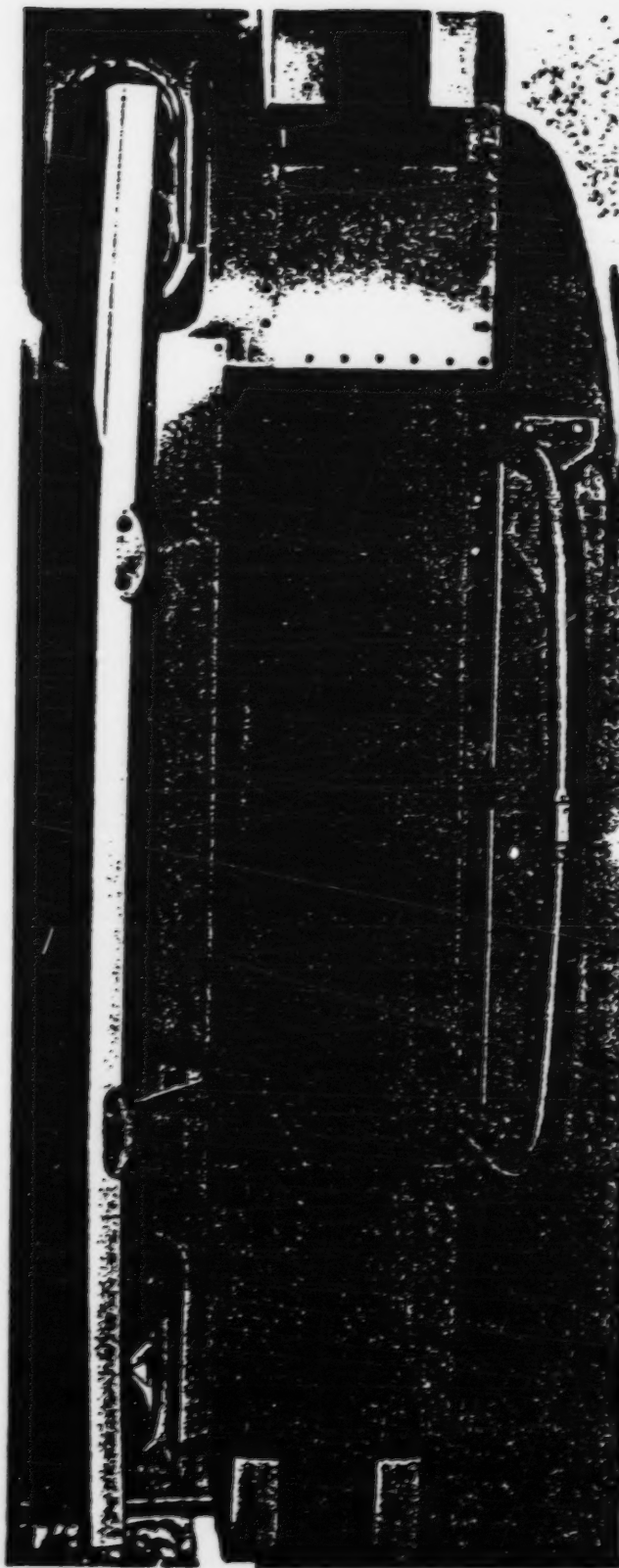
Safety Equipment

A 2½ lb. (1.3 kg) dry chemical fire extinguisher, a ten-unit first aid kit and fire axe are included as standard equipment. Three fuses are carried at the driver's area and three reflector type flares are located in the curbside tool compartment.

Standard Tools

A 12 ton jack, wheel lug wrench, and run up block are provided.

Stair box compartment is conveniently located behind the front bumper



17 MCI		
Overall length	39' 11 1/2"	12,180mm.
Overall width	96"	2,440mm.
Overall height	133"	3,378mm.
Wheelbase	285"	7,240mm.
Overhang, front	70 1/4"	1,785mm.
Overhang, rear	124 1/4"	3,155mm.
Center aisle width	14"	355mm.
Ceiling height, center aisle	Front 78 1/2"	Front 1,994mm.
	Rear 75 1/2"	Rear 1,918mm.
Underfloor luggage capacity	300 cu. ft.	8.5M ³
Overhead parcel rack capacity	122 cu. ft.	3.5M ³
Turning radius, L.H. or R.H. turn	47' 6"	14.5M
Turning radius, L.H. or R.H. turn at body corner	50' 7"	15.6M
Tire size: 14 Ply "G" Rating	11.00 x 20 (tube type)	11.00 x 20 (tube type)
	11.50 x 20 (tube type)	11.50 x 20 (tube type)
	12.5 x 22.5 (tubeless)	12.5 x 22.5 (tubeless)
	12.0 x 22.5 (tubeless)	12.0 x 22.5 (tubeless)
14 Ply "G" Rating	12.5 x 22.5 (tubeless)	5151
Fuel Tank capacity	136 U.S. Gallons at 95°; Filled	5151
Weight, dry	26,900 lbs.	12,202kg.
	79.09.12	

All specifications, information and other data in this brochure are subject to change or revision without notice.

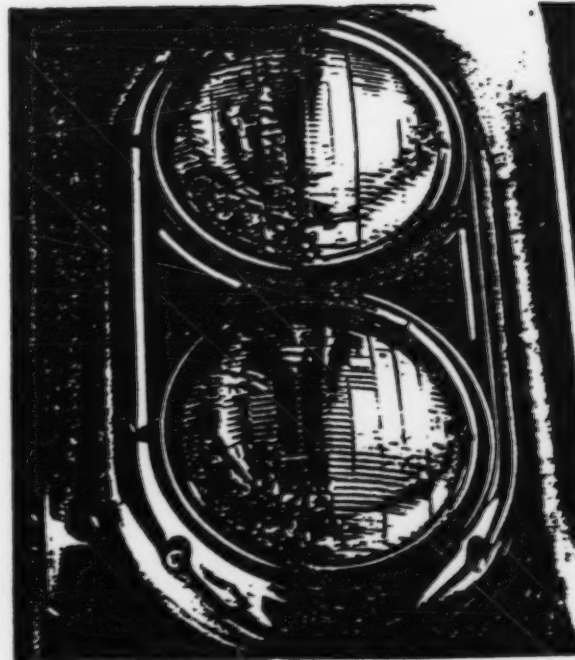
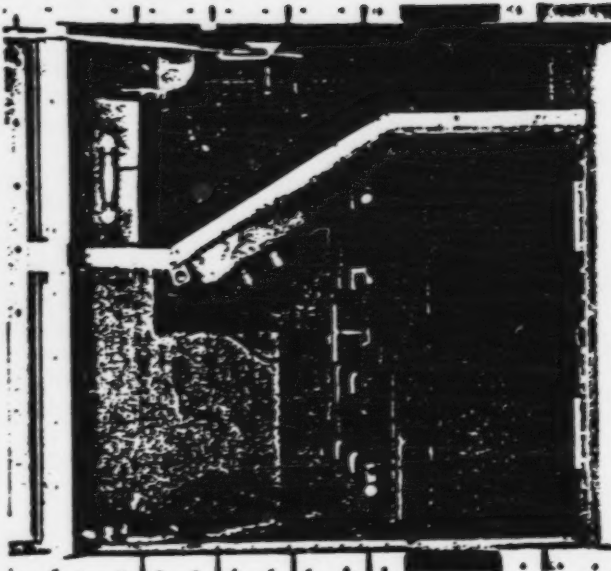
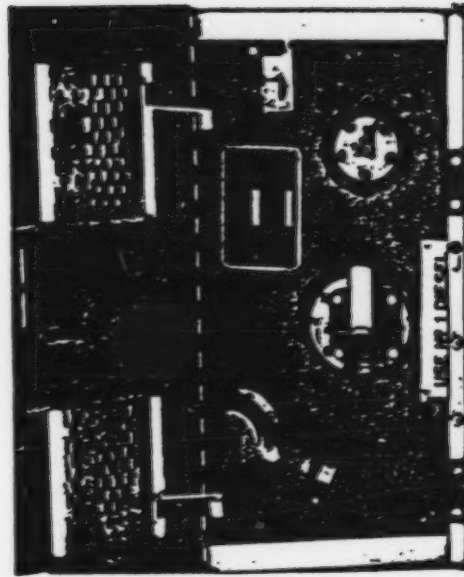


Photo of front view of vehicle

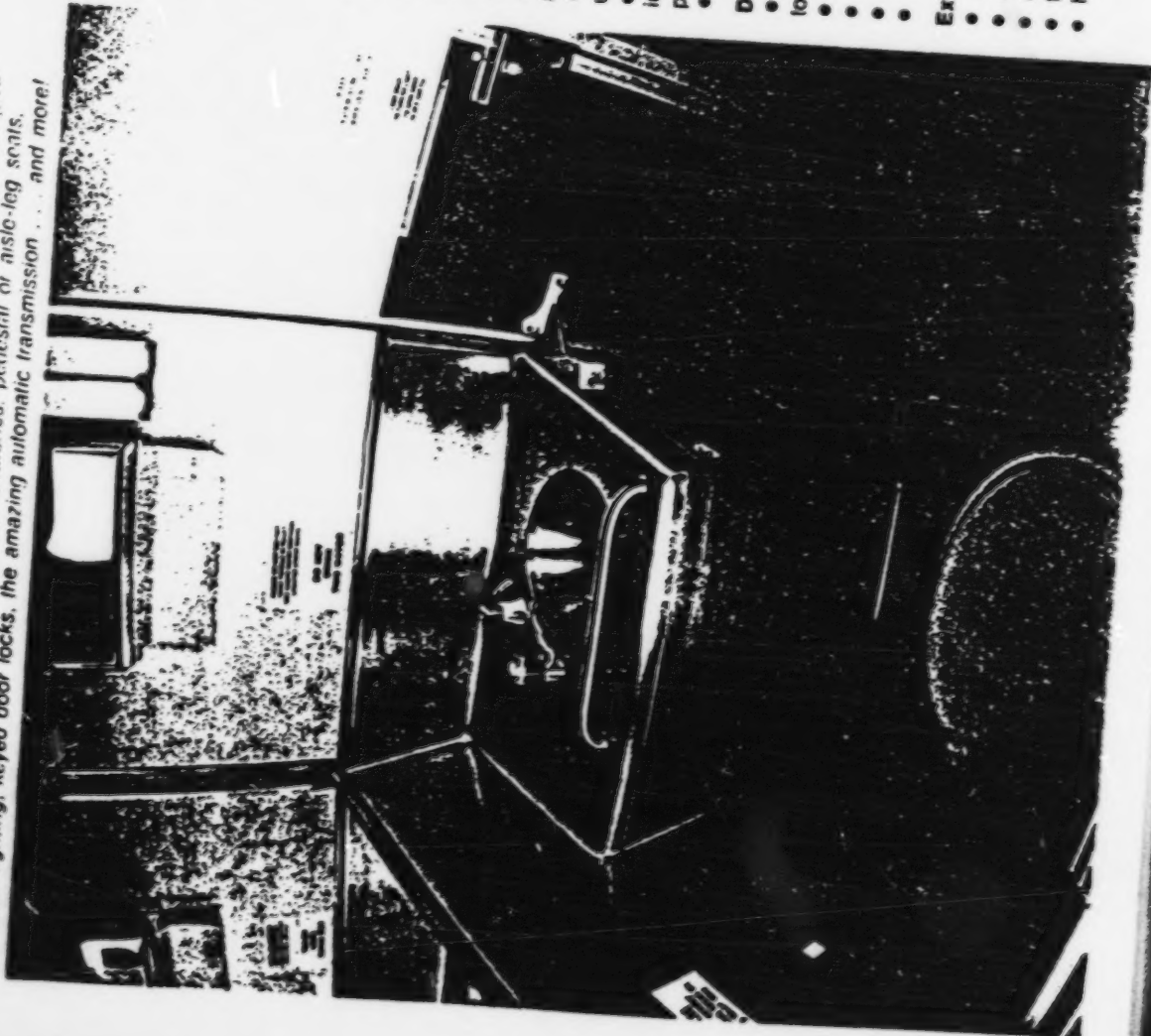


Batteries are positioned side by side in curbside compartment. Battery disconnect switch also is located here. Compartment will accept optional "Queen" size batteries.



Fuel filler neck is accessible through a separate service door.

Choose from hundreds of options. Your MCI sales representative can give you more information about flush or chemical lavatories, pedestal or aisle-leg seats, in-station lighting, keyed door locks, the amazing automatic transmission . . . and more!



optional equipment available

Choose from hundreds of options. Your MCI sales representative can give you more information, for example, about flush or chemical lavatories, pedestal or aisle-leg seats, in-station lighting, keyed door locks, the amazing automatic transmissions . . . and more!

A wide range of optional equipment is available on the MC-9 Crusader II to adapt it to unusual conditions and regulations.

Passenger Convenience Options

- a fully-equipped washroom with either a flush-type or conventional chemical toilet.
- 110-volt interior in-station lighting system to assist passengers boarding the vehicle
- a wide range of interior finishes and seat upholstery
- a wide selection of seating arrangements including a choice of center pedestal, aisle pedestal or aisle leg type seats
- retractable step

Driver Convenience Options

- acrylic protective guard behind the driver's seat to inhibit passenger interference during operation
- bi-parting entrance door
- Allison automatic transmissions
- fuel level gauge or a low level fuel sensor
- driver's speakers

Extreme Weather Options

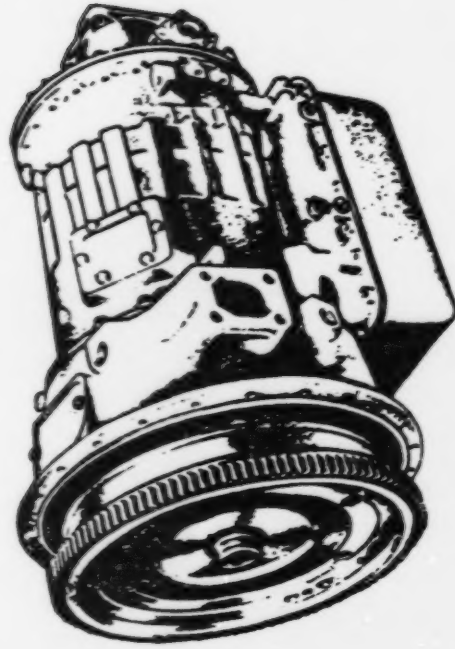
- double-glazed windows
- engine and lavatory immersion heaters
- radiator shutters
- third air conditioning unit
- heated exterior rear view mirrors

Optional automatic transmissions offer many benefits

More than 75% of the Crusader coaches coming off our production lines are optionally equipped with automatic transmissions. There are many excellent reasons why more and more operators are choosing automatic units over the standard clutch-type transmission. Both four and five speed automatics are available.

- eliminates or reduces many maintenance costs. With the automatic you can say goodbye forever to clutch repairs, adjustments, and the related down time
- the torque converter absorbs shocks to the drive train that occur with manually operated gearboxes
- eliminates engine overspeeding and lugging. Overspeeding is impossible and lugging is eliminated because the unit downshifts to prevent this condition.
- increases tire life because power flow to drive wheel is smooth and uniform
- good fuel mileage
- safer operation because driver keeps his hands on wheel at all times. Also, driver is less fatigued because physical demands of clutching and shifting have been minimized
- training of drivers is easier and quicker due to simplicity of operation
- vehicle abuse sharply reduced because the automatic virtually "thinks" for itself and prevents misuse.

All of these advantages of the optional automatic transmissions add up to solid economic benefit for you and should be seriously considered when specifying optional equipment.



Model HF-720
four speed
automatic
transmission



Shift lever
is pedal
mounted to
right of
driver

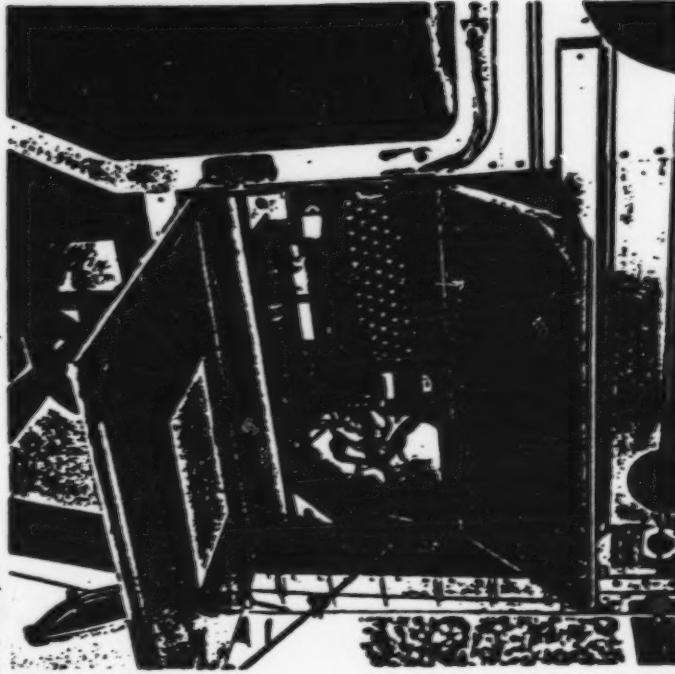
maintenance quicker, easier...and less costly

Many practical ideas have been incorporated into the design of the MC-9 Crusader II to eliminate or reduce maintenance costs:

- the engine, transmission and related components are mounted on an easy-to-remove cradle
- the engine is mounted in-line for easy accessibility to both sides
- clutch can be replaced without pulling the engine
- a series of well-located panels provide access to engine, electrical components, wiper motors, batteries, air-conditioning equipment and filters from outside the coach and make routine maintenance fast and easy
- radiators are also accessible through special access doors
- windshield glass, sash glass, and baggage doors are interchangeable which results in a smaller inventory of necessary parts
- brake lining, shoes, bearings, seals, etc. of the trailing axle are interchangeable with front axle, again simplifying replacement and reducing inventory
- wheels and tires on all axles are also interchangeable
- all eight direct-acting telescoping shock absorbers are interchangeable
- dual shocks are provided on the rear axle
- many more time and money saving features such as standard automatic belt tensioners, a single air filter, easy-to-adjust track-mounted seats and passenger reading lights.

All of these and other maintenance innovations have been engineered into the MC-9 to save you time and money. Also, the MCI staff of field service representatives keep in touch with each operator to advise on service and maintenance matters and to make sure you get the best possible return on your investment in the MC-9 Crusader II.

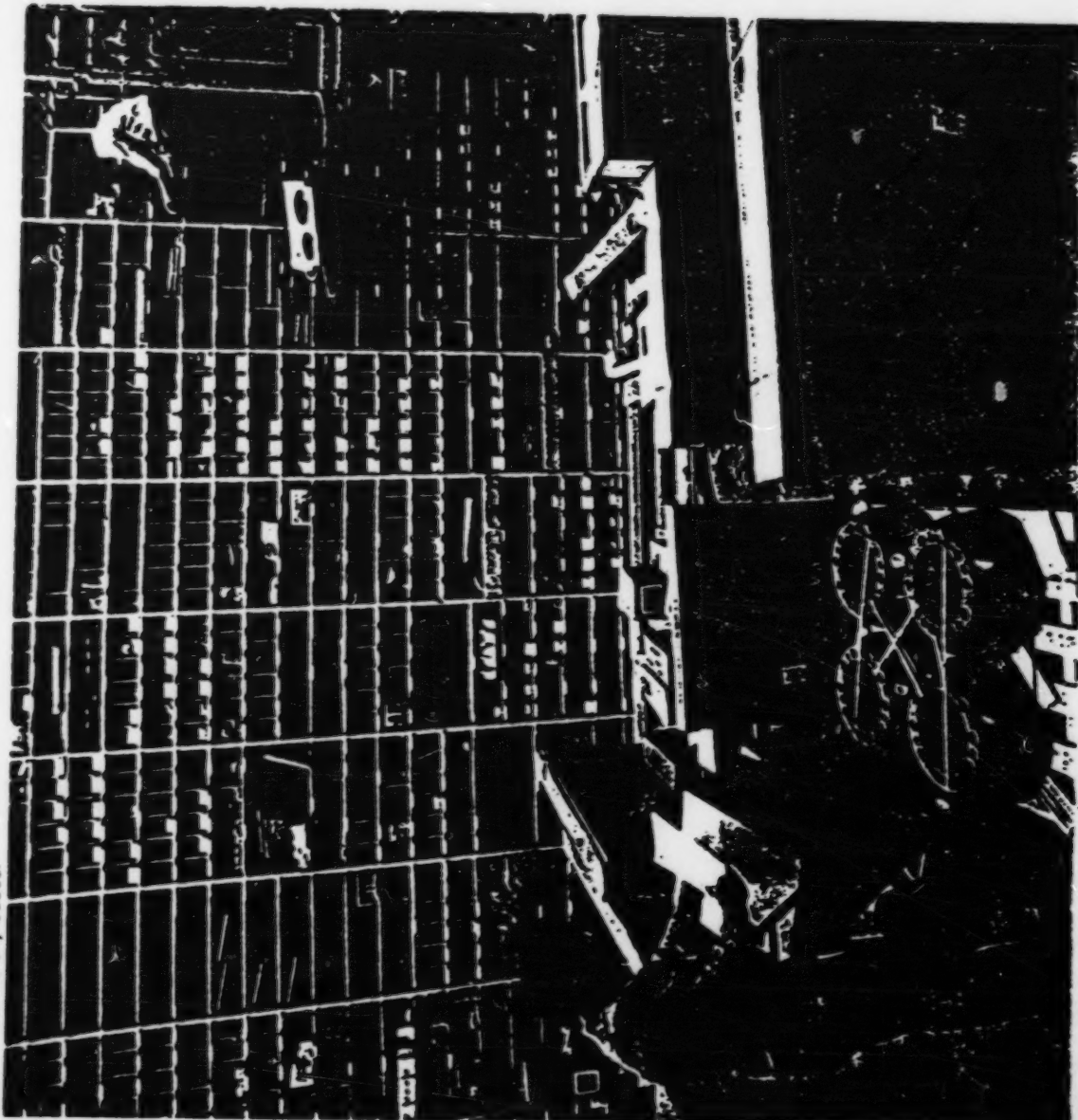
Ingenious sealed electrical panel allows quick servicing of circuit breakers, light flashers, buzzers and relays.



Automatic belt tensioners are one of many well thought-out features to reduce maintenance and service time.

warranty and replacement parts

More than 32,000 parts are stocked for repair and replacement of all makes of intercity buses.



If the MC-9 Crusader II is as good as we claim it to be, then we should be willing to back it up. We do — with an extravagant 150,000 miles (240,000 km) or 18 months warranty on labor and material.

The engine of course, carries the extended Detroit Diesel Allison Division warranty.

When conditions arise where MCI is at fault, we will do whatever is necessary to correct them. This pledge covers all warrantable parts... the coach, its equipment, materials and workmanship. We believe we build a better bus than anyone else and we are willing to back it better, too!

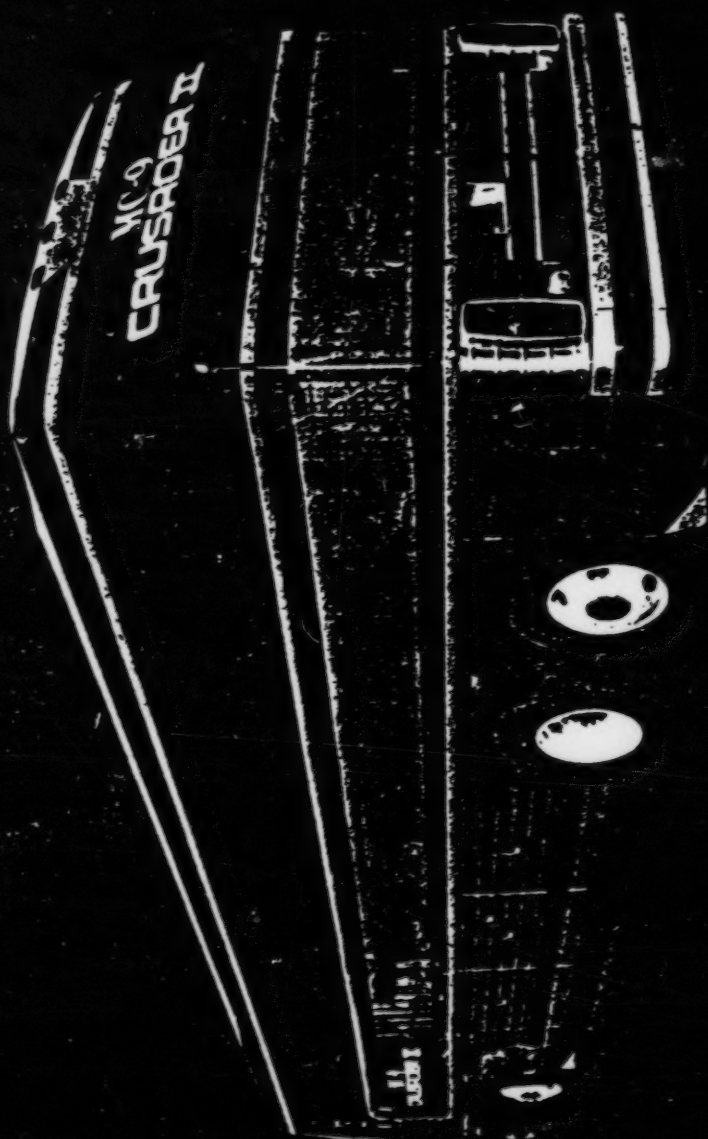
Warranty and service are factory controlled by MCI Ltd. Service Dept., Winnipeg. MCI maintains a staff of trained service representatives covering all areas.

The final ingredient that makes the MC-9 Crusader II a truly worthwhile investment for any bus operator is the ready availability of repair and replacement parts.

MCI Ltd. Service Parts Division, Winnipeg, Canada, is the exclusive parts source for the Canadian market and maintains a complete computerized inventory of all MCI bus parts as well as parts for other intercity and transit buses.

Ordering is simple. For stock you can complete and mail the easy-to-use printed order form and the parts will be shipped at our expense. Shipping by other means may be specified. For even quicker service in emergencies, you can order parts by calling MCI Ltd. at 204-475-9112.

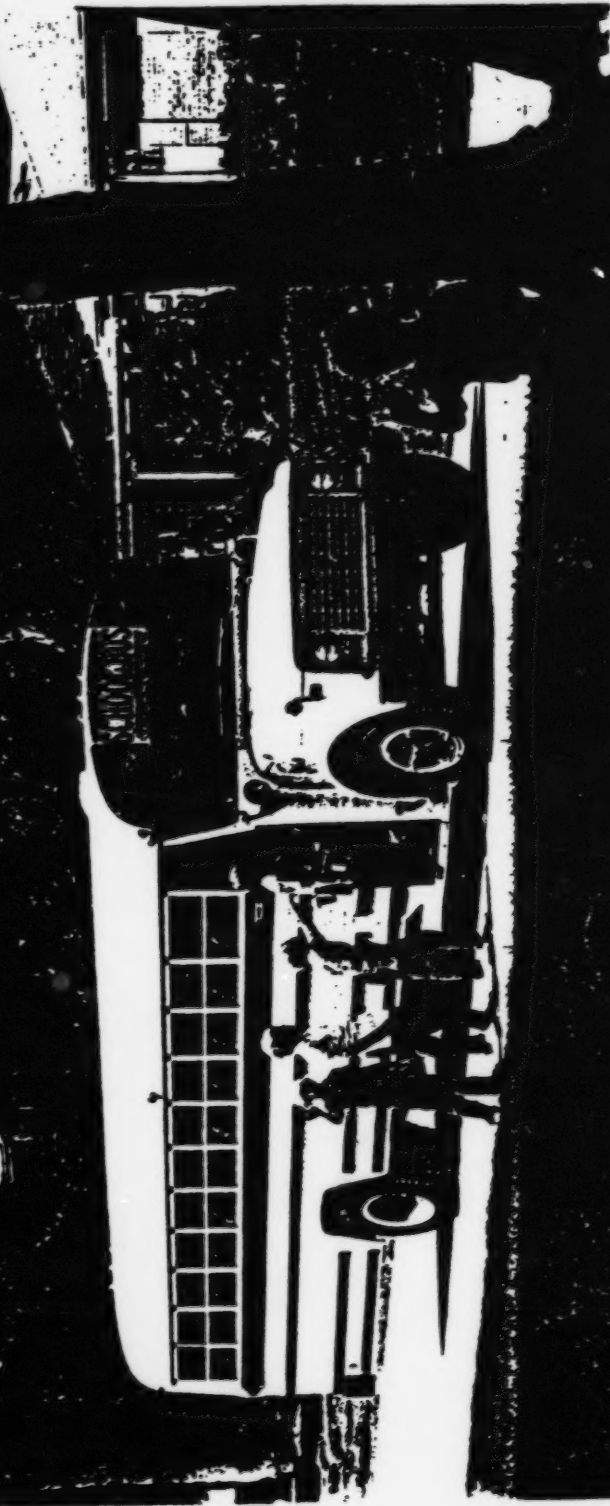
Of course, all replacement and repair parts are of the same high quality as those used as original equipment.

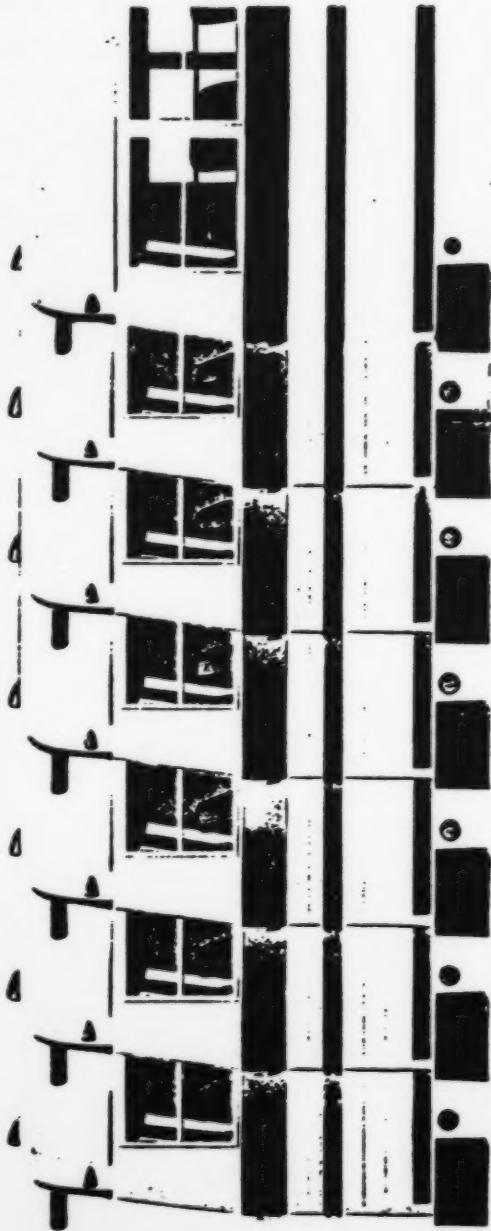


Motor Coach Industries, Ltd.
1149 St. Matthews Ave. Winnipeg, Manitoba R3G 0J8
Phone 204-786-3301

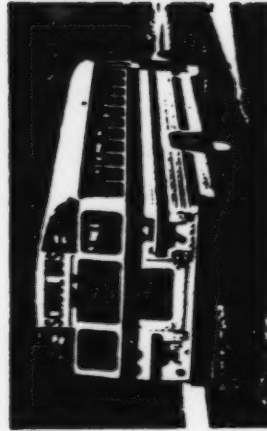
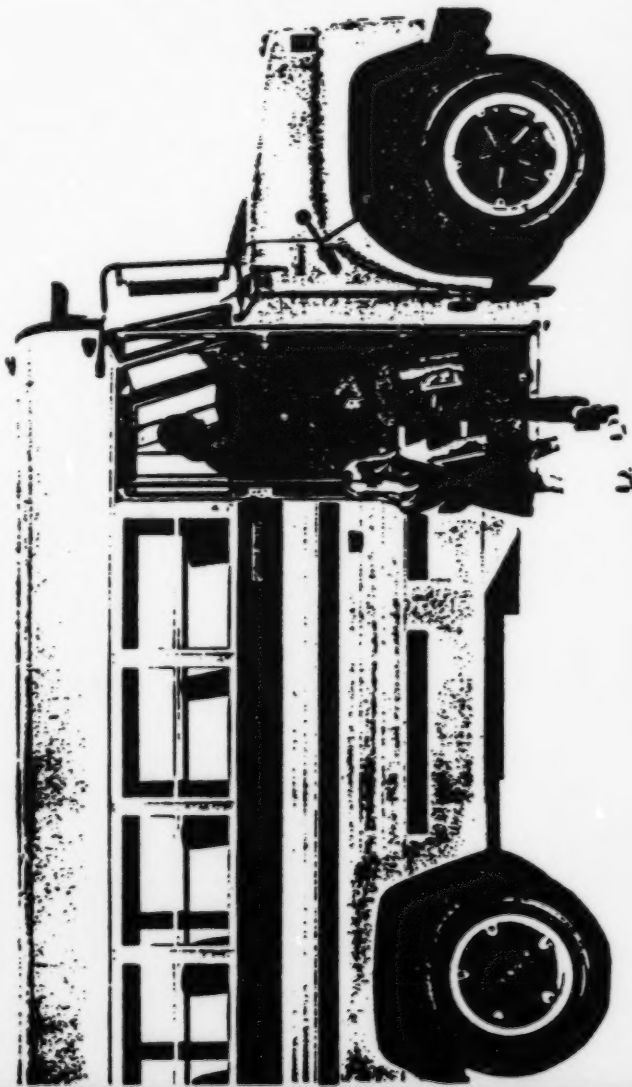
SUPERIOR

SCHOOL BUSES

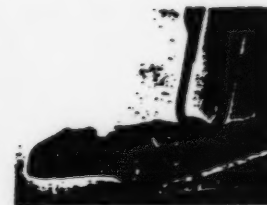


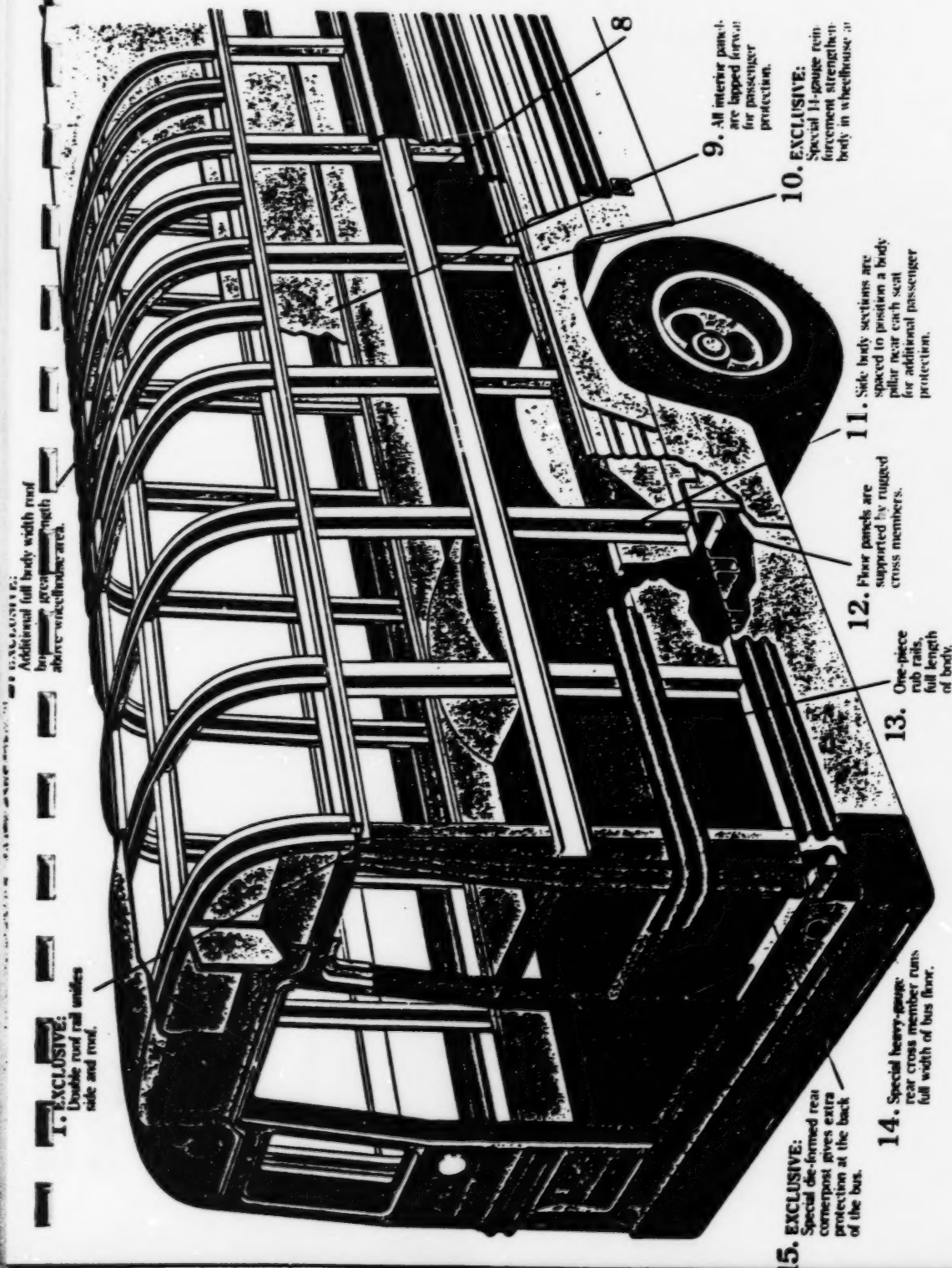


A leader in any industry becomes a leader by developing greater expertise, using greater imagination, and utilizing the state of the art research and production equipment available. Add experience to this, and you have Superior... the school bus leader for more than 50 years. You have a variety of passenger seating capacities to most economically suit your needs; a variety of chassis lengths and makes; a variety of construction advantages that help set the industry safety standards year after year. You have the best school bus value on the market. Because leadership always has satisfied customers behind it.



Superior bodies meet or exceed all federal and state requirements at time of manufacture. Superior bodies carry a full 12 month, 12,000 mile warranty. (Through your local Superior dealer.)





EXCLUSIVE:
Additional full body width roof
bracing, greater length
above wheelhouse area.

EXCLUSIVE:
Double roof rail unites
side and roof.

9. All interior panels
are lapped forward
for passenger
protection.

10. EXCLUSIVE:
Special H-gauge rein-
forcement strengthens
body in wheelhouse area.

11. Side body sections are
spaced to position a body
pillar near each seat
for additional passenger
protection.

12. Floor panels are
supported by rugged
cross members.

13. One-piece
rub rails,
full length
of body.

15. EXCLUSIVE:
Special de-formed rear
cornerpost gives extra
protection at the back
of the bus.

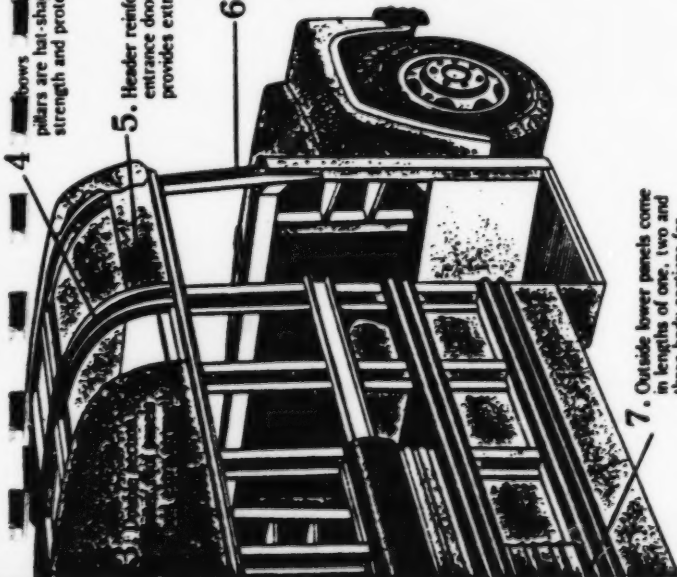
14. Special heavy-gauge
rear cross member runs
full width of bus floor.

Being a leader carries its own responsibility. A responsibility to the best product design and construction possible. That's why you'll find five basic construction strengths in Superior school buses that you won't find in any other bus. Superior strength... uncompromised by reduced weight that helps increase operating economy. See for yourself.

4. Millwork made of hat-shaped pillars are hat-shaped for strength and protection.

5. Header reinforcement at entrance door and driver window provides extra front-end strength.

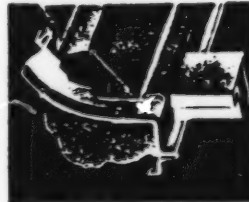
6. Slimline windshield cornerposts are "L"-shaped, high strength steel to provide strength without bulk and reduce blind spots to improve driver visibility.



7. Outside lower panels come in lengths of one, two and three body sections for ease and economy in repair. Side skirts have curved lower edges to reduce buildup of moisture and mud.

8. Longitudinal member at beltline adds additional strength.

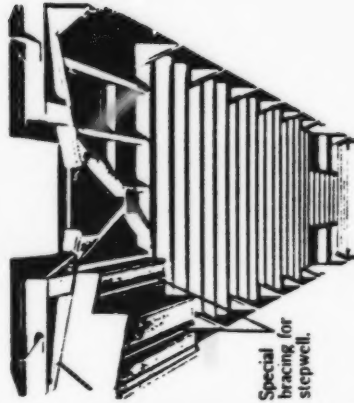
Floor assembly of heavy-gauge steel puts extra protection under your passengers as well. Floor panels are supported by rugged cross members and reinforced by sill gussets. Then a .35% deep guard plate surrounds this construction and forms the extra-heavy seat ledge.



Double roof rail construction strengthens side and roof by welding the full-length longitudinal strainer at the roof to the full-length steel rail at the top of the side pillars. Made of heavy-gauge steel, they are also shaped to reinforce and support each other the full length of the bus.

Rugged cornerpost of 14-gauge steel that's 9 1/2" at the top, increasing to 12 1/2" at the beltline and base. Specially die-formed with six bends and welded to the rear-most side pillar, as well as to the floor and roof rail.

Floor structure is made of steel with the cross members placed closely together - no more than 7" apart - giving an extra strong base for the body.



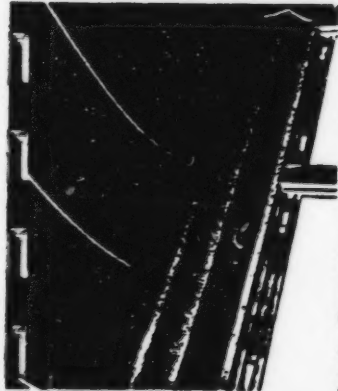
Special bracing for stepwell.



Seat latch. Aluminum seat slides with nylon latches. Standard.



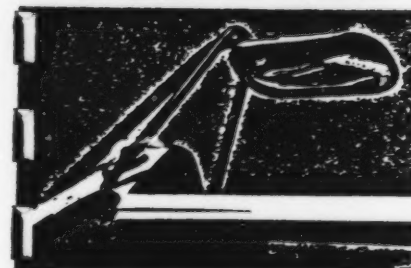
Emergency exit windows with minimum effort required to open: just lift latch and push. Optional extra.



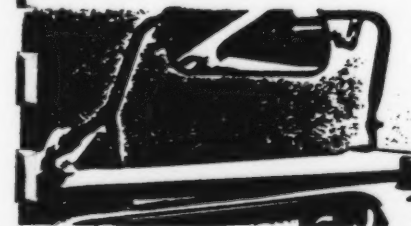
Interior. These embossed ceiling panels and new light bar above windows provide adequate, efficient illumination ... a safety and convenience feature. Standard.



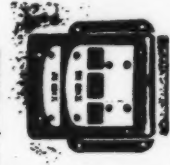
Dual mirrors. Two mirrors mounted on one bracket - conventional 6" x 12" rear view mirror at top, 4" diameter convex mirror at bottom that gives wide angle rear view. Optional extra.



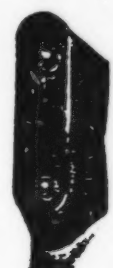
Roof mounted mirror. Securely bracketed, electrically heated, rear view mirror in right or left hand models. 6" x 12" size. Optional extra.



Side mounted mirror. Held securely in place at top and bottom this rear view mirror is mounted right or left hand models. 6" x 16" size. Standard.



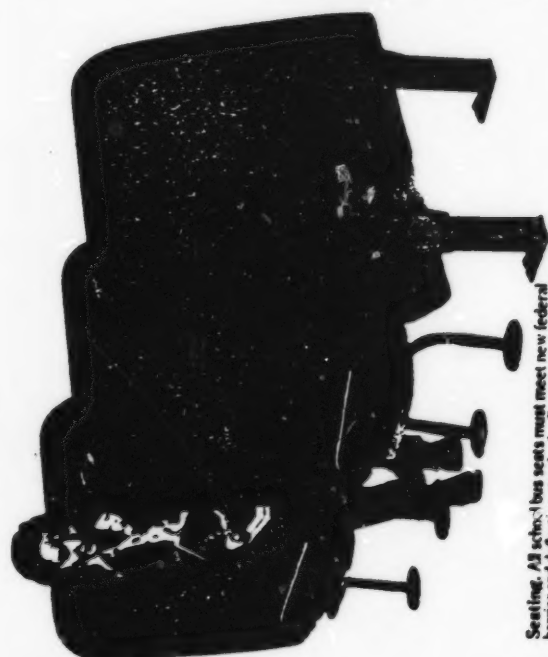
Electrical Monitoring System. Tells the driver when front or rear warning light's fail to operate. Optional extra.



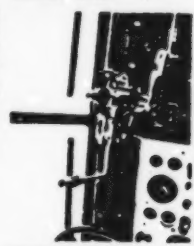
Front Vigilite monitoring panel. Located above windshield, the Vigilite indicates whether warning lights are working, so driver knows when to let children off the bus. Vigilite is a fiber-optic system, no bulbs or wiring to worry about. Optional extra.

EMERGENCY DO

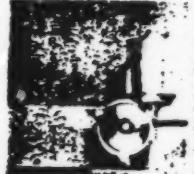
Rear Vigilite monitoring panel. Located over the rear emergency door, this Vigilite system lets driver know when rear lights are working. He can check his rear view mirror. Optional extra.



Seating. All school bus seats must meet new federal barrier and deflection standards. But we set our standards higher - for safety, comfort, and strength. It isn't required. It is Superior.



Heavy duty door control. Rugged construction assures years of good service. Easy to operate, within easy reach of driver. Standard. Chromed finish handle and control rod are optional extras.

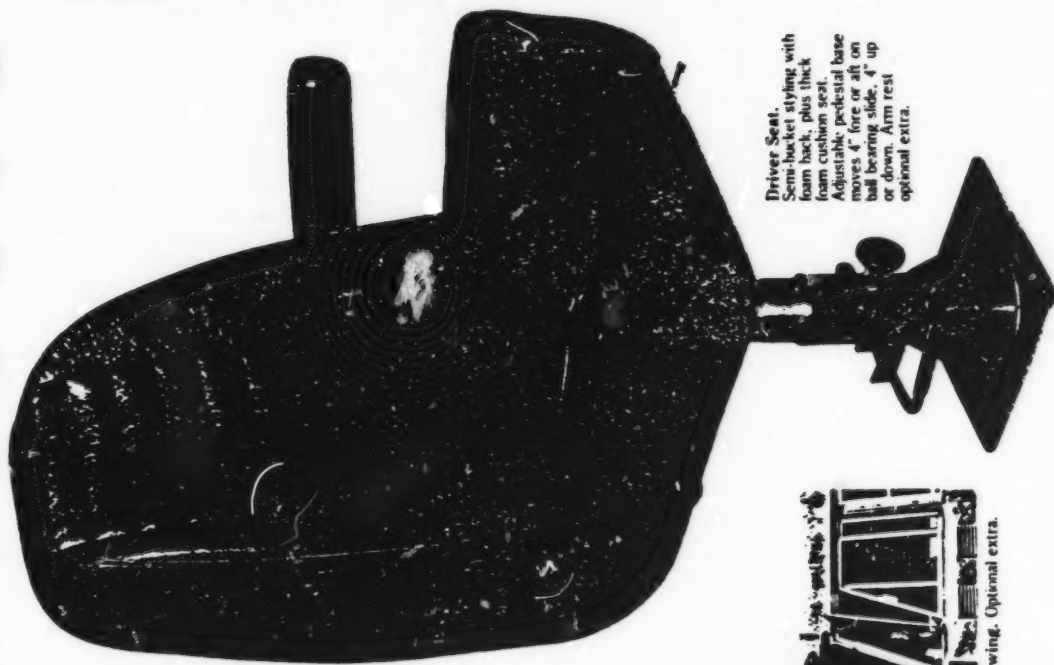


Dual windshield wiper motors. Operate wipers separately or both at the same time ... without depending on the same motor. Standard.

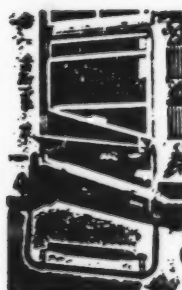


Transparent sun visor with padded edges. Standard.

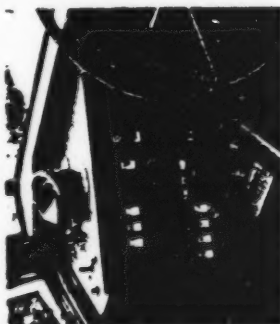
Control and comfort for driver and passengers are critical elements in any bus. But if they are not designed for convenience, they defeat the purpose. Superior features and options are designed and positioned with years of practical, in-use experience. And that in itself becomes a large part of overall safety.



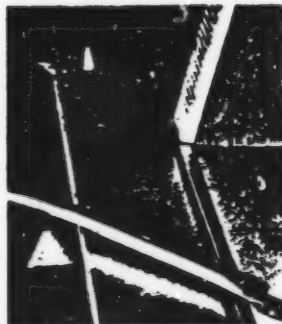
Driver Seat.
Semi-bucket styling with foam back, plus thick foam cushion seat. Adjustable pedestal base moves 4" fore or aft on ball bearing slide, 4" up or down. Arm rest optional extra.



Driver's vent wing. Optional extra.



Control panel has new wood grain design and border trim, and is angled to improve driver's view of and accessibility to switches.

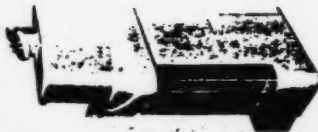


Right-hand barrier has been redesigned to place an aluminum steel post between the bottom of the barrier and the floor. The grab rail has been repositioned to give more clearance between the handle and the barrier.

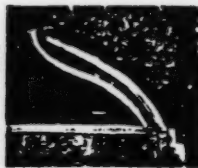


Rear view mirror. Extra large interior mirror measures 6" x 30" to give the driver a full view of what's happening inside and outside the bus. Standard.

Right-hand oval heater.
Take-up space in front right corner of bus. Excellent for heat distribution. Full accessibility. Full defrosts right windshield upper rear glass. This extra.



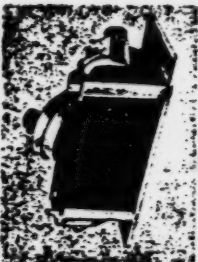
Flexible tubes for left-hand heaters.
Covering around heater hose serves as armor plate - protects driver from hose malfunction. Standard.



Left-hand bull's eye defroster. Directs a jet stream of warm air at eye level for faster defrosting. The swivel swivels so air jet can be aimed at stubborn frost or ice. Standard.



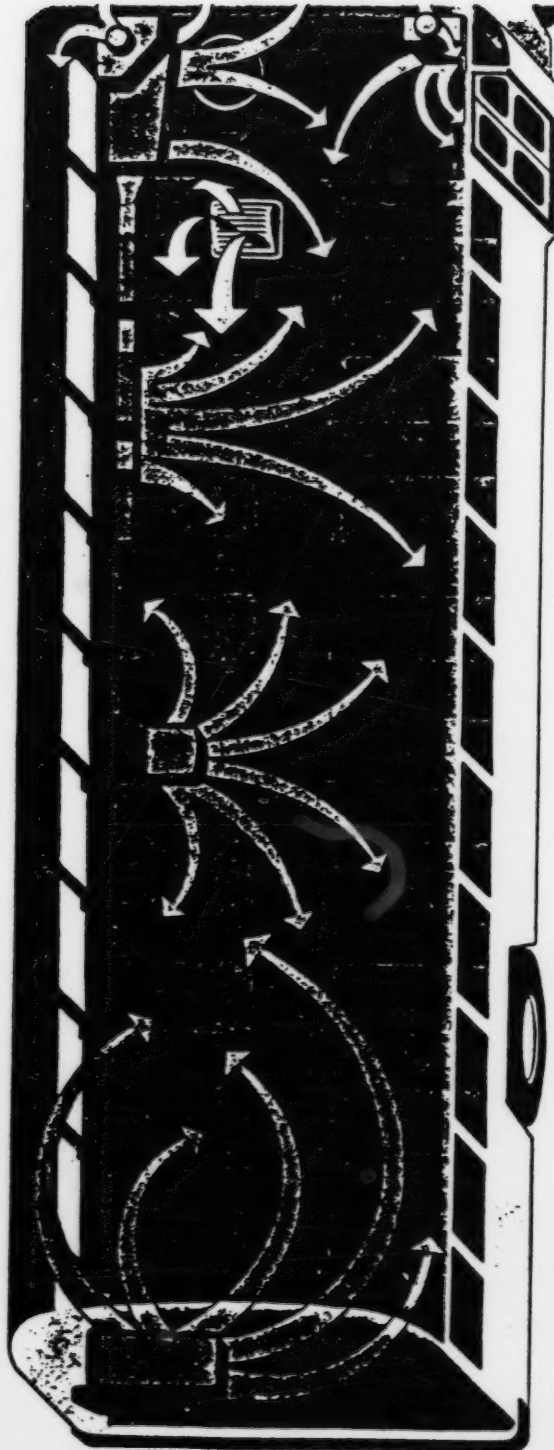
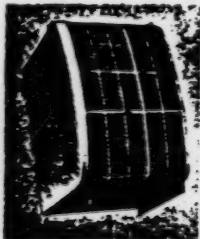
Centrifugal blowers. Three of them in the main left-hand heater provide rapid heat distribution and defrosting. Superior maintenance manual gives simple instructions on core removal. Standard.



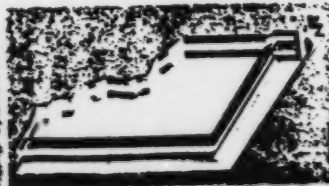
Double-fan underseat heater. Blows air to the rear of the bus to assist in keeping the rear window's clear. Optional extra.



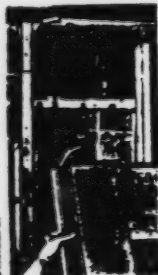
Single fan underseat heater. Delivers additional warm air when needed. Optional extra.



Storm windows.
Double-glazed windows. A
smart way to keep the heat
inside and the glass from
icing. Optional extra.



Opens easily for maintenance.
Front heater and defroster motors and
blower assemblies are interchangeable
to help minimize parts inventory.
Standard.



Outside access panel is optional,
and provides access to the left-hand
heater core.



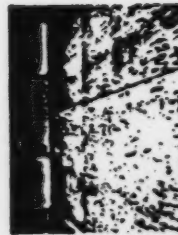
Thermal/acoustical insulation.



Designing in comfort goes beyond controls, seating and options of an extra measure of safety. It also means all-weather interior comfort, and once again experience shows. Superior offers a ventilation and heating system that assures front-to-rear consistent comfort...and construction features to assure maximum comfort efficiency.

Standard left-hand, fresh air heater and defroster.

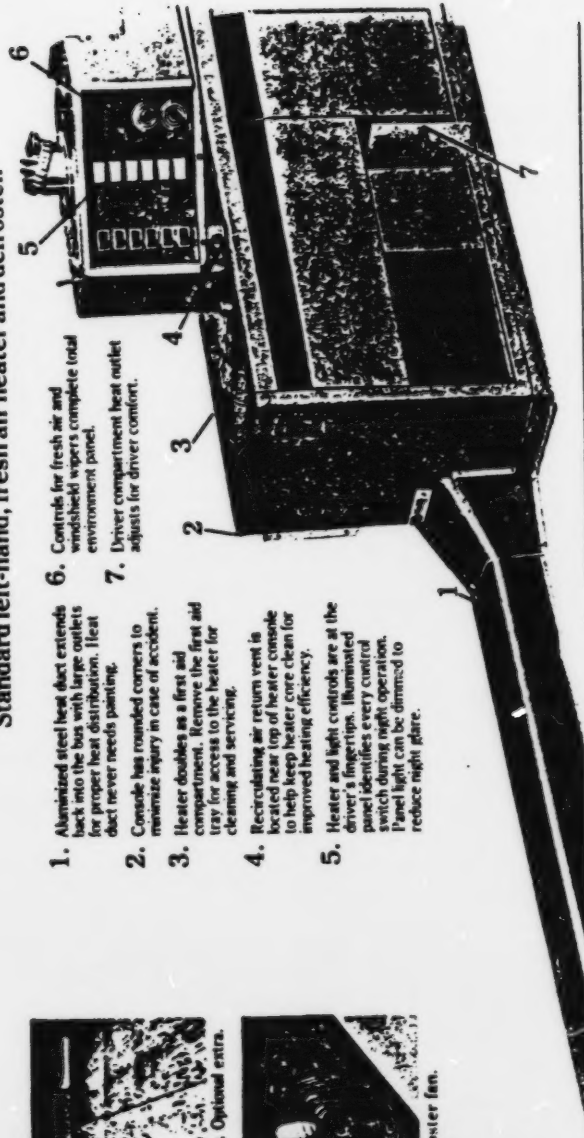
1. Aluminized steel heat duct extends back into the bus with large outlets for proper heat distribution. Heat duct never needs painting.
2. Console has rounded corners to minimize injury in case of accident.
3. Heater doubles as a first aid compartment. Remove the first aid tray for access to the heater for cleaning and servicing.
4. Recirculating air return vent is located near top of heater console to help keep heater core clean for improved heating efficiency.
5. Heater and light controls are at the driver's fingertips. Illuminated panel identifies every control switch during night operation. Panel light can be dimmed to reduce night glare.



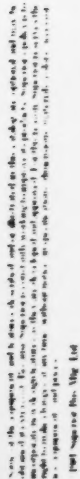
Pyrex floor. Optional extra.



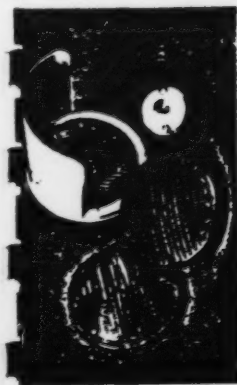
Electric defroster fan.
Optional extra.



6. Controls for fresh air and windshield wipers complete total environment panel.
7. Driver compartment heat outlet adjusts for driver comfort.



or every Superior school bus there is also a host of optional extras to "customize" your vehicle to your needs. Here are a few:



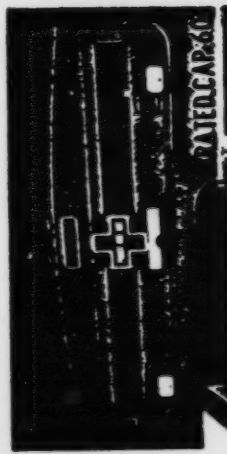
Entrance door hush light, roof warning lamp visors



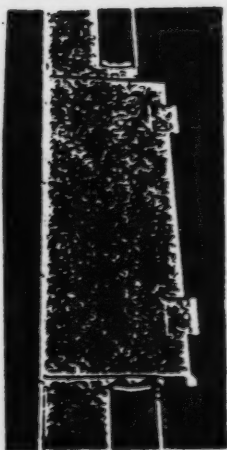
Stop signs: manual, vacuum and air



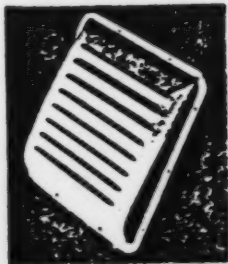
Air horns



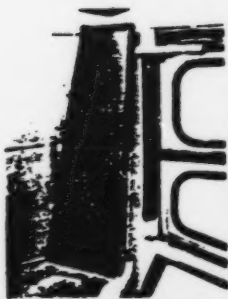
Emergency equipment compartment



Enclosed tool box



Road vent, power exhaust



Entrance door header pads



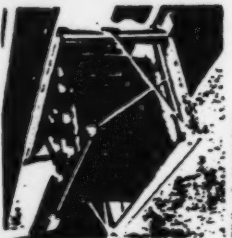
Shoulder pads



Emergency door lower glass and action panel



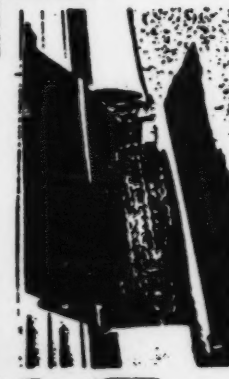
Dust shield



Siding battery tray



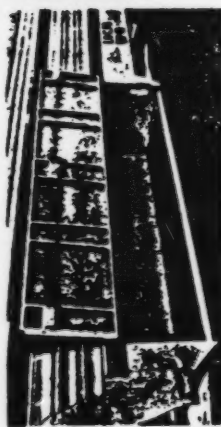
Rear tow hooks



Enclosed tire cutting



Road luggage rack



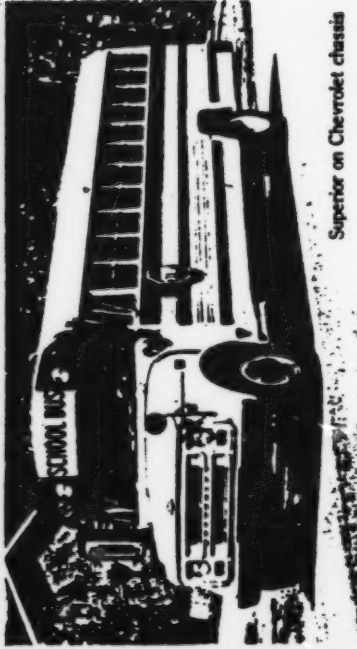
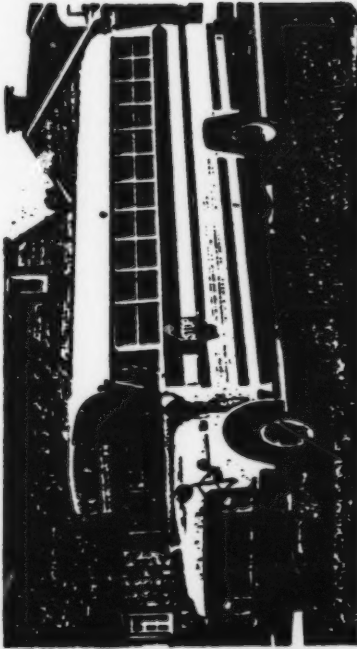
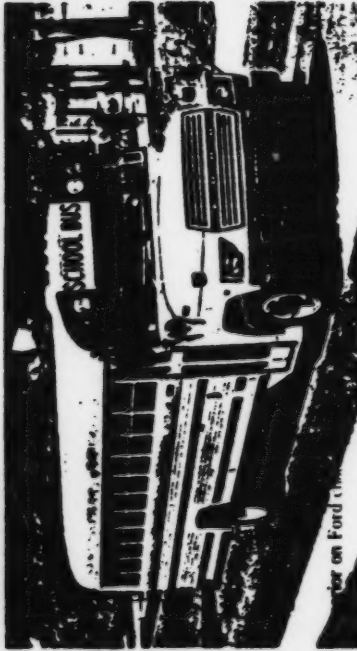
Under floor luggage compartment



Mud flaps

Contact your local Superior dealer for additional options your school may desire.

A CHOICE OF CHASSIS



for on Ford

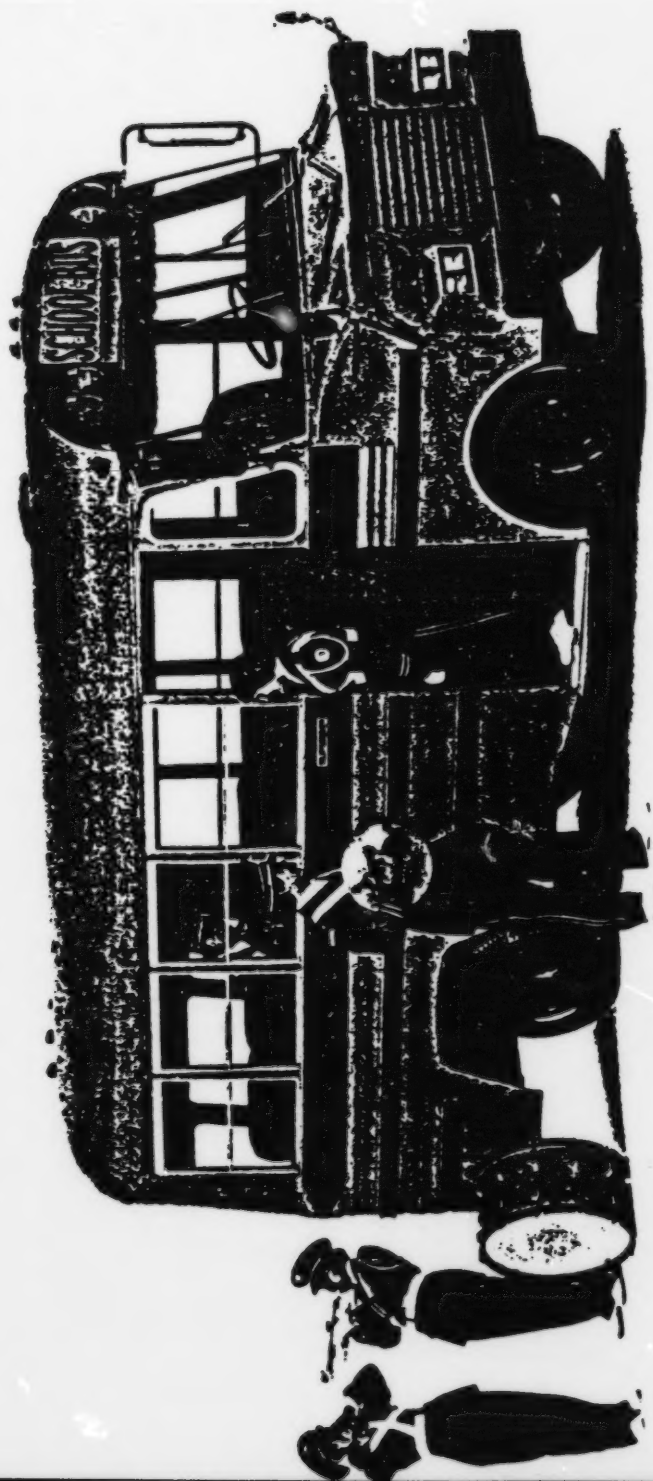
Superior on Chevrolet chassis

Superior Bus Mfg. Ltd./Morris, Manitoba ROG 1K0

SUPERIOR

The name that sets the standard for the industry.

SUPERIOR PIONEER



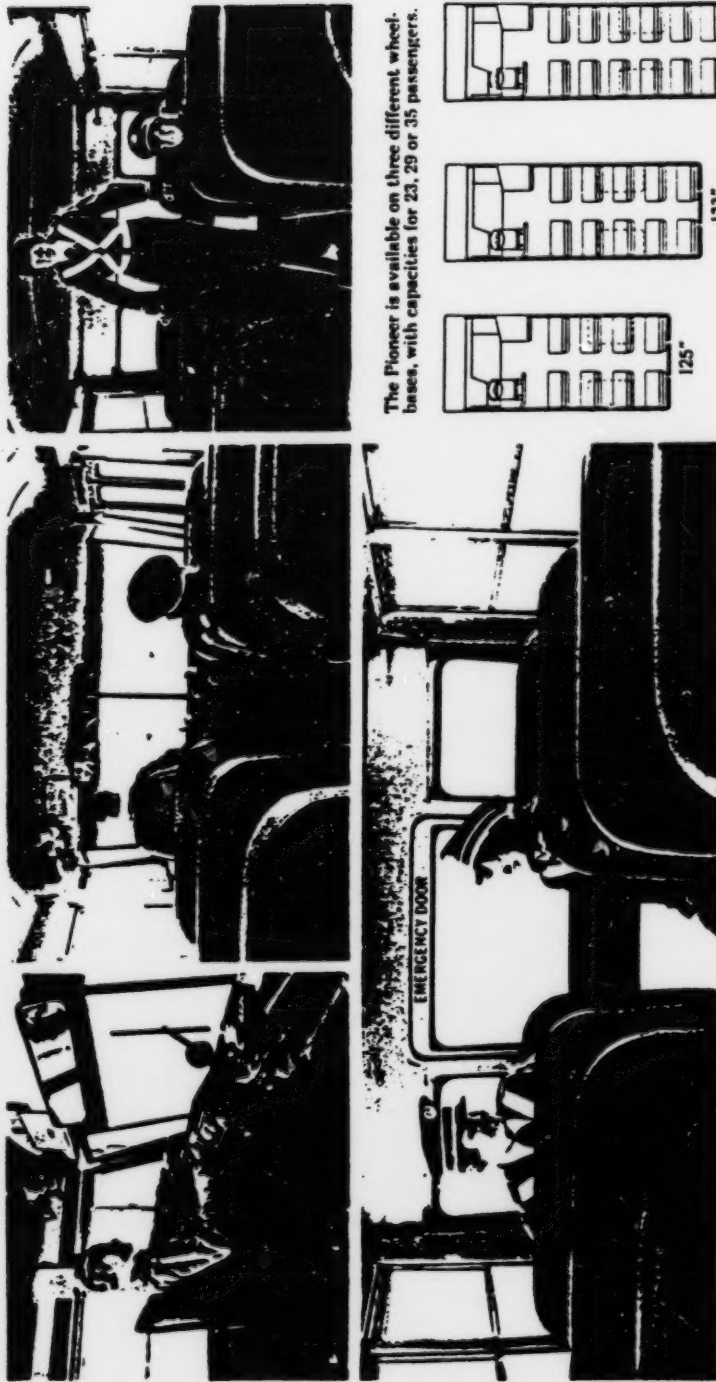
Extra width means extra capacity.

The Superior® Pioneer is conventional-bus width, and has 78" headroom to handle even the basketball team. It's a middle-sized school bus with big-bus comfort and conveniences. The Pioneer maneuvers in close quarters, is easy to park, and driver visibility is outstanding. Available on three wheelbases,

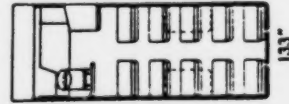
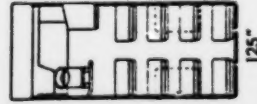
the Superior Pioneer provides safe transportation for 23, 29 or 35 passengers. And the Pioneer has all the convenience of forward control.

The Pioneer body strength is Superior because it's manufactured to the Superior standards which have led the industry since

1931. Superior's zinc-steel construction and safety-engineered framework give your student-passengers the security they need. The Pioneer is just one of the wide range of Superior school buses, the widest range in the industry. And you can be sure it has Superior strength and safety... built-in.



The Pioneer is available on three different wheelbases, with capacities for 23, 29 or 35 passengers.

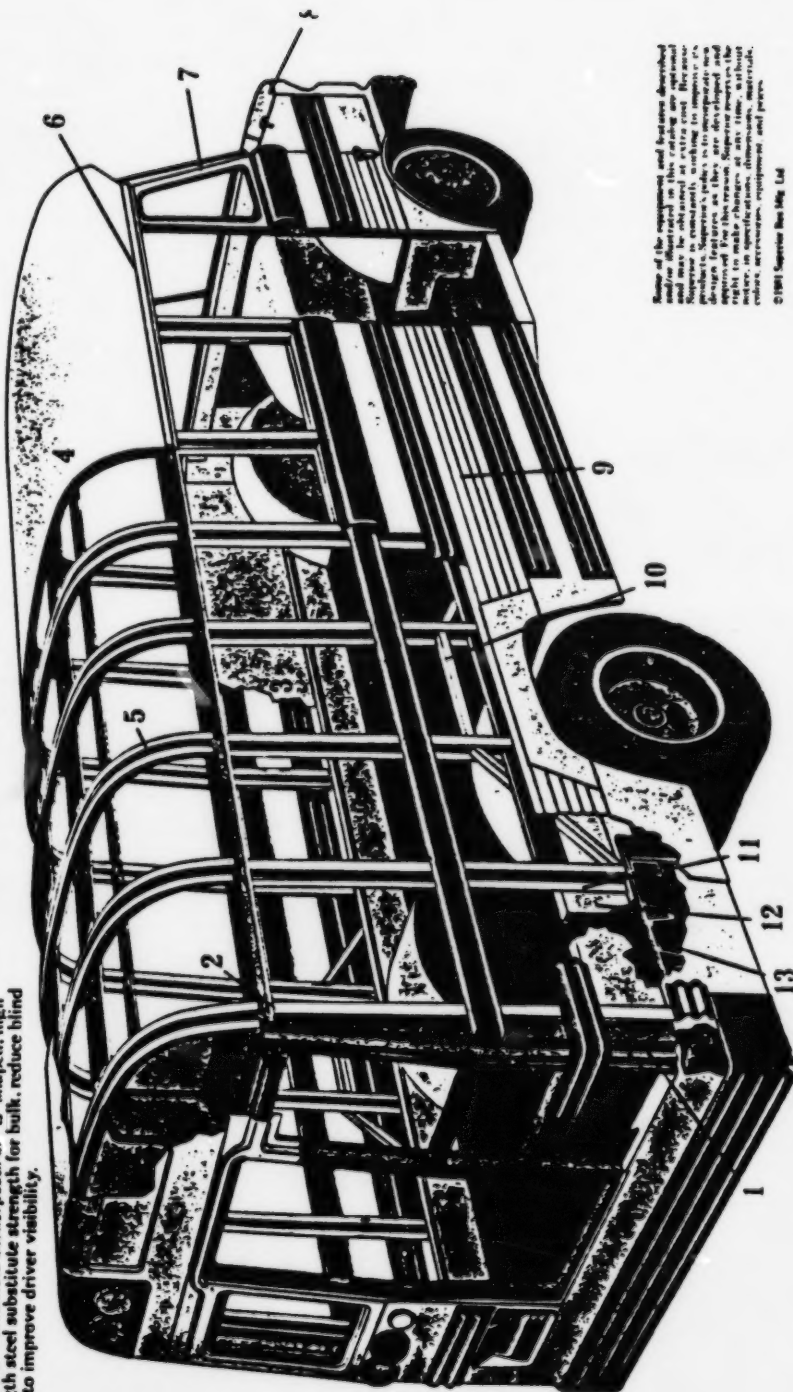


The strong points about Superior® all zinc-steel welded construction.

1. Rugged rear cornerpost is specially die-formed with six bonds and welded to the rear-most side pillar, as well as to the floor and roof rail.
2. Double roof rail unifies side and roof.
3. All interior lower panels are lapped forward for passenger protection.
4. Double section outer roof panels add extra strength.
5. Roof bows and side body pillars are hat shaped for strength and protection.
6. Header reinforcement at the entrance door and driver window provides extra strength to front end.
7. Slimline windshield cornerposts of "L" shaped, high strength steel substitute strength for bulk, reduce blind spots to improve driver visibility.

8. Complete front end of fiberglass, a protection against corrosion and easily repaired; also noise deadening thermal urethane-foam insulation.
9. Exterior body side panels come in lengths of one, two, or three body sections for ease and economy in repair. Side skirts have curved lower edges to reduce accumulation of moisture to help prevent rust.
10. Tubular steel bracing strengthens body in wheel-house area.
11. Side body sections are spaced so a body pillar is near each seat for additional passenger protection.

12. Floor panels of heavy-gauge steel put extra protection under passengers. They are supported by rugged cross members and reinforced by all gussets. Guard plate surrounds construction and forms extra-heavy seat ledge.
13. Floor structure is made of steel with cross members placed closely together, giving an extra strong base for the body.



Some of the equipment and features described and/or illustrated in this catalog are optional and may be obtained at extra cost. Because Superior's products are designed to meet the needs of a wide range of applications, design features as they are developed and tested may be subject to change without notice, in specifications, dimensions, materials, color, accessories, equipment and prices.

©1981 Superior Bus Mfg. Ltd.

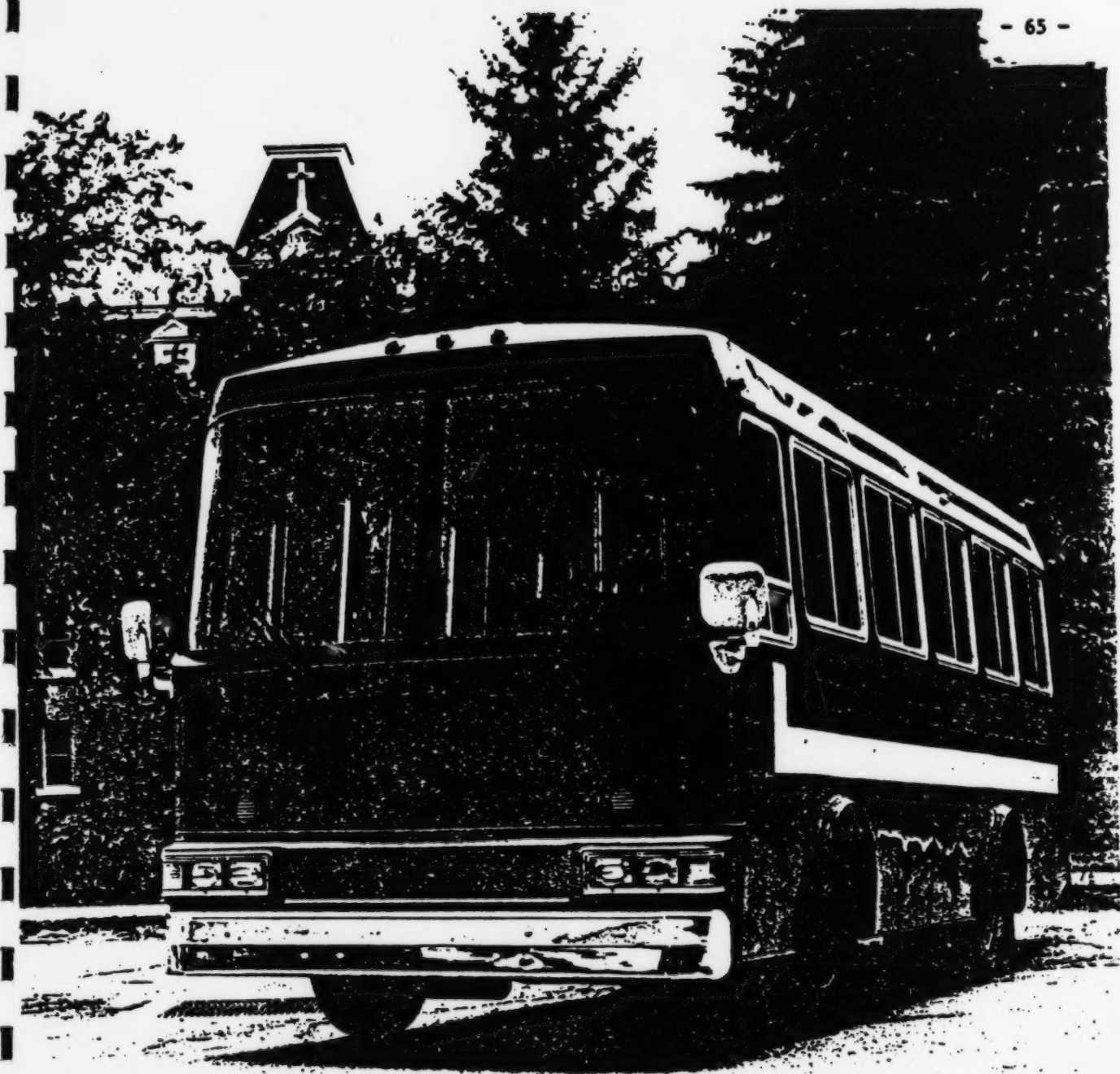
Special care for special passengers. Your Pioneer school bus can be equipped to safely and conveniently handle handicapped passengers. Single- or double-door electro/hydraulic lifts provide easy entry and exit. This is Superior care... because your special passengers deserve nothing less.



SUPERIOR BUS MFG. LTD. • MORRIS, MANITOWA R0G 1K0

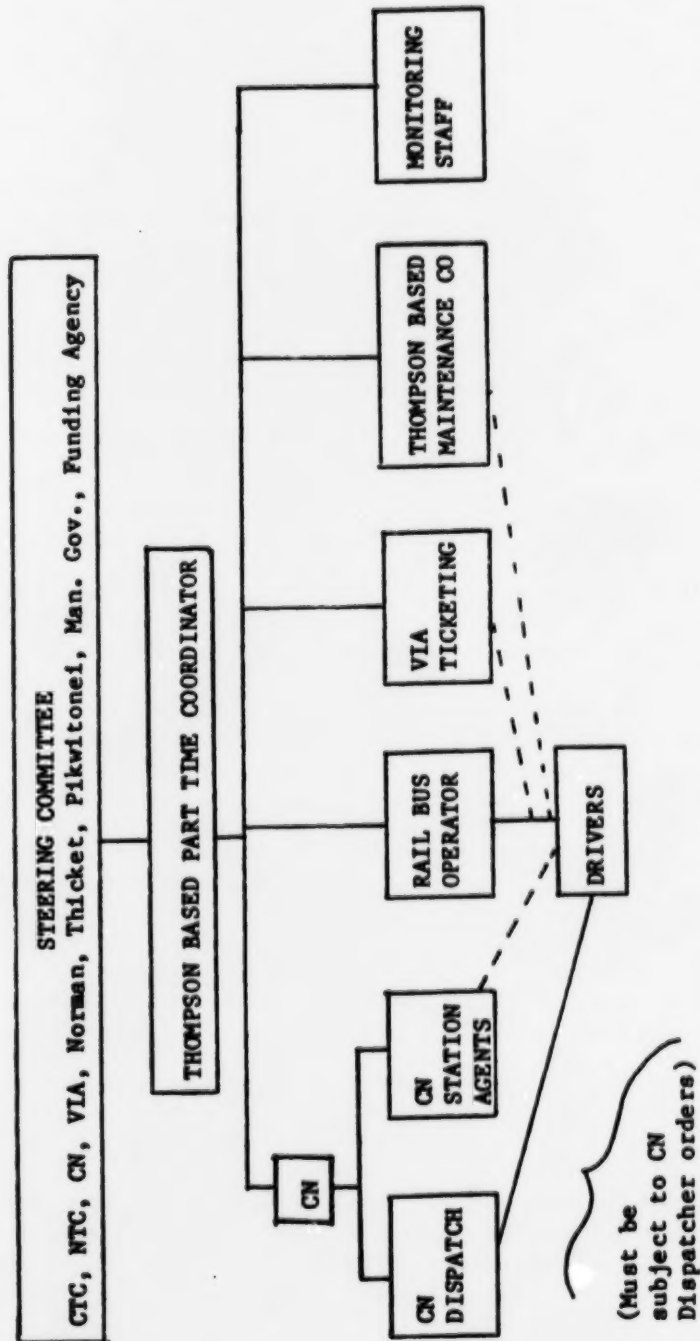
SUPERIOR

The name that sets the
standard for the industry.



APPENDIX IV-a

Suggested Organization Chart During Rail Bus Demonstration Project



APPENDIX V-A

Winnipeg Coach Cost

Basic Unit	\$75,000 (quote attached)
Turntable	8,000 " "
Emergency Heating	5,000 (estimated)
Radios & Phone	5,000
Freight	
45000 lb. @	
\$2.00/cwt. =	900
Subtotal	\$93,900
10% Contingency	\$10,000
TOTAL:	\$103,900

Salvage value after 10 years not calculated, however should be recognized.

LP -

RESOURCE DEVELOPMENT ASSOCIATES LTD.

APPENDIX V-a

• Management Consultants

December 17th, 1982

• 105-62 HARGRAVE STREET
WINNIPEG, MANITOBA R3C 1N1
TELEPHONE (204) 947-0318-9

Wes Graham
Manager
Passenger Policy
Transportation Division
Department of Highways and
Transportation
16th floor
215 Garry Street
WINNIPEG Manitoba

Dear Wes

Re: Northern Manitoba Rail Passenger Service

Recently I contact you on behalf of Winnipeg Coach Sales and Service in reference to the supply of a bus for the rail bus passenger service under consideration in northern Manitoba.

The firm repairs, rebuilds, and modifies to order our city busses. The owner, Orest Ochitwa, learned of this project through the Greater Winnipeg Water District and has asked me to assist him to pursue the matter of supplying rail busses for use in remote areas where passenger service is light but never-the-less needed.

As you will see, Mr. Ochitwa has developed a full set of specifications based on a Western Flyer (inter-city) bus he has on hand. The bus would be equipped with steel flanged wheels supplied by the Winnipeg plant of Canadian Bronze.

The entire renovation and modification of the bus will take place in Winnipeg Coach providing needed employment here. Drawings of the bus are available.

Mr. Ochitwa has done considerable research into the production of rail busses with the Water District engineers and others and is confident he can supply a vehicle which will be eminently suited to the proposed test program.

. . . 2

LP
RESOURCE DEVELOPMENT ASSOCIATES LTD.

Wes Graham

-2-

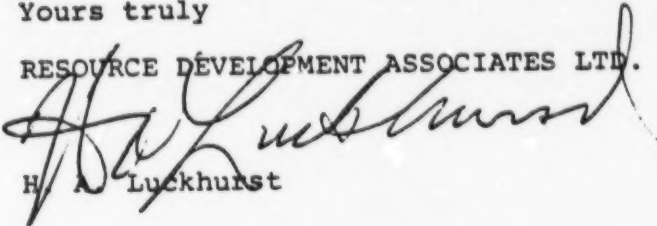
December 17th, 1982

Additionally, this could be the beginning of a new industry here as there appears to be a demand for such a vehicle elsewhere. I have been asked to pursue this on behalf of Mr. Ochitwa.

I trust you will refer this to the committee for consideration. We would be pleased to supply any further information on request and to meet with you and/or the committee whenever convenient.

Yours truly

RESOURCE DEVELOPMENT ASSOCIATES LTD.



H. A. Luckhurst

HAL/jb

Winnipeg Coach Sales and Service

1005 WILLIAM AVENUE
WINNIPEG, MANITOBA
TELEPHONE (204) 786-8819

(1)

BODY Bus type with full frame structure- for rail use only

MODEL Western Flyer -T40161

WHEELBASE 244 inches (400 inches overall plus length of cowcatcher)

ENGINE International-(GAS) 450 CU. IN.

TRANSMISSION Allison (Automatic) at 540 Series

DIFFERENTIAL(S) Rockwell/ Timken (4 Wheel Drive)

BRAKES Bendix Westinghouse Air Brakes drum type at all four drive wheels w/ 7 inch brake blocks

PARKING BRAKE Bendix-Westinghouse spring load w/ air overrule

FUEL STORAGE TANK 120 Imp. Gals. (5455 Litres)

LIGHTING Headlights, Marker Lights, Signal Lights, Hazzard Warning, Fog Lights, Interior Lights, installed to conform to Interstate Commerce Commission Regulations as well as all Provincial and Federal regulatory Bodies in Canada

SEATING 38 Heavy Duty vinyl covered non-reclining- Inter City Coach type seats with 15 3/4 inch spacing between seats

HEATING SYSTEM Carter underseat heaters (7) required

HEATER RATING 12 volt 6000 B.T.U. per heater total output
(if required) 42000 B.T.U.

NOTE: Heating system being 100 % recirculated air through heaters. Fresh air available. Fan motors speeds of all heaters and windshield defrosters, controlled through variable speed type type switches mounted on dash at drivers position. Fresh air intake fan controlled through direct on/ off switch. Ventilation and heating systems selected and controlled through master alternating switch.

WASHROOM Located at L.H.S. rear of coach w/ holding tank located below floor level & vented within wall panels to roof aperture. Lighting in washroom effected by control switch in door locking device.

Winnipeg Coach Sales and Service

1005 WILLIAM AVENUE
WINNIPEG, MANITOBA
TELEPHONE (204) 786-8819

(2)

BAGGAGE LUGGAGE AND / OR EXPRESS Five storage compartments Total capacity approx. 170 CU. FT.
Two interior (overhead) luggage racks, capacity approx. 66 sq. ft. of floor area.

PASSENGER ESCAPE DOOR 33 inches by 48 inches escape door (manually operated) located to the rear of midway point of coach body on left hand side (opposite side to passenger entrance door)

INSULATION Coach body insulated throughout with one inch rigid foam board (non- inflammable) insulation R. factor

COWCATCHER Rigid steel construction mounted to bus frame at point of coach body.

OPTIONAL EQUIPMENT Two way radio communications as to specifications
Turntable for reversing direction of unit where Y track is not available (approx. additional cost \$ 2000.00)

DELIVERY TIME Approx. 90 days

ESTIMATE COST (Delivery transport excluded _ \$ 75,000.00

FOOTNOTE: Operation: This unit could be driven by any operator with a class two (or better) drivers license. A short instruction & training period would be necessary to familiarize a new operator with conditions unique to this particular piece of equipment. There would no need for on board back-up personnel.

APPENDIX V-b

MC9 UNIT

Basic Unit	\$250,000
Turn Table	Included
Emergency Heating	5,000
Radio and Phone	5,000
Freight	900
Subtotal:	\$260,900
Contingency	26,000
TOTAL:	\$286,900

Winnipeg Coach Sales and Service

1005 WILLIAM AVENUE
WINNIPEG, MANITOBA
TELEPHONE (204) 786-8819

March 11, 1983

(1)

BODY Bus type (uni-body const.) converted rail use only

MODEL MOTOR COACH IND. M.C.9

WHEELBASE 285 inches.

ENGINE DETROIT DIESEL 6V 93 T

TRANSMISSION ALLISON AUTOMATIC H.T. 754 C.R.

DIFFERENTIALS ROCKWELL / TIMKEN 4 wheel drive

BRAKES BENDIX / WESTINGHOUSE air brakes drum type at all
four wheels.

PARKING BRAKE B/W spring load w/air override.

FUEL STORAGE TANK 120 IMP. GALS.

LIGHTING Headlites, Marker lites, Signal lites, Hazzard warning
lites, Fog lites, Interior lites, installed to conform
to I.C.C. Regulations as well as all Provincial & Federal
Regulatory bodies in Canada.

SEATING 47 Passenger (44 reclining) Inter-City coach type seats.

HEATING Central heating system.

AIR CONDITIONED Central air cond.

WASHROOM Located at R.H.S. rear of coach occupancy warning lite
as well as Interior lites effected by control switch in
door. Locking ~~door~~locking device.

PASSENGER ESCAPE All side windows are kick out type as are windshields.

CONCATCHER Rigid steel construction mounted to front of coach body.

INSULATION Insulated throughout with wrapped fibreglass insulation
in walls (1 in.) Unwrapped (2in.) in ceiling.

Winnipeg Coach Sales and Service

1005 WILLIAM AVENUE
WINNIPEG, MANITOBA
TELEPHONE (204) 786-8819

(2)

BAGGAGE LUGGAGE &/OR EXPRESS Three full width storage bins below floor level. (approx. 200 cu. ft.) Access doors located on both sides of coach body. Two full length overhead luggage racks located inside coach body. (approx. 100 sq. ft.)

OPTIONAL EQUIPMENT 2 way radio as to specs. Turntable for reversing direction of unit where Y track is not available.
(Approx. additional cost \$ 25,000.00)

DELIVERY TIME

ESTIMATE COST Delivery transport excluded \$ 250,000.00

Convert M.C. 9 (47) pass. to combination unit with (27) pass..

Seating capacity w/washroom facilities (front section)

Express & package freight area (rear section)

DISMANTLE & REMOVAL

Remove 10 (double) seats

Remove 3 (rear) bench seats

Remove washroom (for relocation)

Remove 4 side windows (2 each side)

Remove ductwork (approx. 14 ft.) rear

Remove overhead luggage rack rear section.

Remove roof mounted escape hatch.

Remove inner wall panels & ceiling panels (approx. 14 ft.) rear section

SUPPLY & INSTALLATION

Open bus side (L.H.S.) & install door frame, makeup & fit loading door(s) as per customer specifications (approx. 40")

Supply & install exterior panels to cover window openings

Relocate & install washroom.

Fabricate & install washroom (custom) holding tank & dump control valve.

Supply & install checkerplate floor (approx. 14 ft.) rear section

Supply & install bulkhead (rear of passenger section) no access door
to pass. section.

Winnipeg Coach Sales and Service

1005 WILLIAM AVENUE
WINNIPEG, MANITOBA
TELEPHONE (204) 786-8819

(3)

Supply & install inner wall & ceiling panels ($\frac{1}{8}$ " G.I.S. plywood)
Install lighting to rear section & rewire as necessary
Paint interior rear section (white)
Paint coach exterior to customers colours & install lettering, logo, & numbers.

FOOTNOTE(S)

If roof mounted escape hatch is required, it can be installed in roof of passenger section.

Bench seat for rear of pass. section to be fabricated & installed as originally laid out.

DELIVERY TIME Approx. ~~6~~ MONTHS.

ESTIMATE COST \$ 25,000.00

APPENDIX V-c

Bluebird Body Ford Chassis

(4 wheel drive)

Basic Unit	\$118,000
Modifications	25,000
Emergency Heating	5,000
Radio and Phone	5,000
Freight	900
Subtotal:	\$153,900
Contingency	15,000
TOTAL:	\$168,900

Winnipeg Coach Sales and Service

1005 WILLIAM AVENUE
WINNIPEG, MANITOBA
TELEPHONE (204) 786-8819

March 11, 1983

(1)

BODY Bus type with full frame structure - for rail use only

MODEL Bluebird (BODY) Chassis (FORD)

WHEELBASE 246.5 inches

ENGINE Caterpillar Diesel 3208 or gas engine Gl. 427 cu. in.

DIFFERENTIAL(S) F.W.D. (Spicer Dr. Line 1550)

BRAKES Bendix Westinghouse Air Brakes 5" front drum type at four (4)
wheels 7 " rear

PARKING BRAKE B/W -spring load w/air over-rule

FUEL STORAGE TANK (2) tanks (Total 120 Std. Gals.)

LIGHTING Headlights, Marker Lites, Turn Signal Lites, Hazzard Warning
Lites, Fog Lites, Interior Lighting, all installed to conform
to I.C.C. Regulations as well as all Provincial & Federal
Regulatory Bodies in Canada

SEATING (47) passenger Heavy Duty Reclining Inter City Coach type
seats spaced at 15 3/4 inches

HEATING Seven (7) underseat heaters-12 volt at 6000 B.T.U. output
(TOTAL 42,000B.T.U.)

WASHROOM Located at R.H.S. rear of coach

BAGGAGE LUGGAGE AND /OR EXPRESS Storage compartments Total capacity
approx. cu. in. Interior(o/head)
luggage racks Total capacity

PASSENGER ESCAPE DOOR 28 inches wide 52 inches high manually
operated located at rear of coach body

INSULATION (4) inches friction batts

CONCATCHER Rigid steel construction mounted to bus frame at front

Winnipeg Coach Sales and Service

1005 WILLIAM AVENUE
WINNIPEG, MANITOBA
TELEPHONE (204) 786-8819

(2)

OPTIONAL EQUIPMENT Two way radio as per specifications.

Turntable for reversing direction of unit where Y
track is not available. (approx. additional cost
\$ 8000.00)

DELIVERY TIME Six (6) months.

ESTIMATE COST (DELIVERY TRANSPORT EXCLUDED) \$ 118,000.00

BODY Bus type converted to combination passenger & freighter

SEATING 27 passenger.

WASHROOM Relocated to midway point of coach body (ahead of bulkhead)

EXPRESS BAGGAGE FREIGHT COMP. Install bulkhead rear of passenger section
(no access door) to passenger section. Install checker
plate floor (approx. 14 ft.) rear section. Install
exterior panels to replace windows in rear section.
Install inner panels (walls & ceiling) for rough
service. Install lighting to rear section & rewire as
necessary. Paint rear section Interior. Paint exterior
of coach body to customers colours, & install lettering,
logo, & numbers as to customer specifications.

ESTIMATE COST \$ 25,000.00

BUS COST 118,000.00

\$ 143,000.00

APPENDIX V-d

Superior Cost

Basic Unit	\$90,000
Extras	10,000
Conversion	15,000
Turntable	8,000
Communications	
Radio	3,000
MTS	2,000
Freight	900
Subtotal:	\$128,900
Contingency 10%	13,000
TOTAL:	\$141,900

SUPERIOR

SUPERIOR BUS MFG. LTD.

P.O. BOX 460,
MORRIS, MANITOBA, CANADA
R0G 1K0

PHONE: (204)746-2333
TELEX: 07-587802

February 10, 1983.

Mr. M. J. Bablic,
228 Riverside Drive,
Thompson, Manitoba
R8N 0X2.

Dear Mr. Bablic:

SUBJECT: -- RAIL BUS

Following our telephone conversation, find enclosed documents pertaining to the rail car project.

1). The following are the chassis specifications recommended:

Wheelbase 200"
Front of Frame to centerline - front axle 72.75"
Rear axle to rear end - 105"
Overhaul length - 377.75"
Overhaul width - 96."
Frame height ground to top of rail on tires - 28"

FRONT AXLE

Make - Rockwell MODEL FD931
Type I Beam
Rating - 9000 lbs.

REAR AXLES

Make - Rockwell MODEL F106
Type - Hypoid Single Reduction
Rating - 16000 lbs. (Special Beam Hangers)

SUSPENSION:

Front - Neway Air 8500 lbs.
Rear - Neway Air 16000 lbs.

ENGINE

SUPERIOR

Page 2.
February 10, 1983.
Mr. M. J. Bablic
Thompson, MB.

ENGINE

Make DDAD Model 8.2T
Cyl. 8 Bore & Stroke 4.25" x 4.41"
Cu. in disp. 500
Max H.P. 205 @ 3000 RPM
Max Torque 430 @ 1700 RPM
Air cleaner - Dry type Donaldson
Oil filter - full flow

TRANSMISSION

Make - Allison MODEL M + 643
Ratios - 1st 3.58
 2nd 2.09
 3rd 1.39
 4th 1.00
 Rev 5.67

UNIVERSAL JOINTS

Make - Dona Spicer
Size - 1550 series

ELECTRICAL SYSTEM

Type - Delco Remy (Maintenance Free)
Batteries (2) - 12 volt Line Haul 1200
Alt. - L/N 130 amps
Starting Motor -- 12 Volt High output

FRAME

Main Rail Size $\frac{1}{2}$ x 3 x $\frac{1}{2}$ x 8
Material - INX - 50 (50,000 PSi min. yield)
Section Modules - 8.237 In.3 RBM = 411850"
Construction - All bolted

FUEL TANK

76 Gallon Capacity (65 gallon drum) (In frame)
Primary & secondary fuel filters (US)

SUPERIOR

Page 3.
February 10, 1983
Mr. M. J. Bablic
Thompson, MB..

AIR SYSTEM

Standard Dual Air Brake system
4 air reservoirs .4469 cu.in total capacity
Automatic Drain Valve on wet tank-manual drain
Cocks on 3 other tanks
Parker Hannifin Parflex Hose
16.1 CFM air compressor (Midlant Ross)

EXHAUST

Single Muffler and tail pipe mounted on
L.H. side of chassis

INSTRUMENTATION

Speedometer
Water temperature gauge
High water temperature warning light & buzzer
Oil pressure gauge
Low oil pressure warning light & buzzer
Dual air pressure gauge
Two low air warning lights w/buzzers
Voltmeter
Fuel level gauge
8 Manual Reset circuit breakers
1 Master Reset circuit breaker
Hi beam indicator
Ignition Key Switch
Starter button
Head light switch
In Engine compartment (mounted in panel) push
Button Starter Switch
Ammeter
Oil pressure gauge
Air restriction gauge

MISCELLANEOUS

Dual electric horn
Headlight dimmer switch mounted on floor
Air brake foot valve
Throttle Pedal cable control
Transmission shift quadrant-Pedestal Mounted

SUPERIOR

Page 4.
February 10, 1983 .
Mr. M. J. Bablic
Thompson, MB.

COOLING SYSTEM

Remote Radiator: tube & Fin construction
with integral bottom tank
Trans. oil cooler
Seperate draw down/Deaeration tank
Hydraulically driven fan thermostatically
Controlled

- 2). It is recommended to use a school bus body because of the option of length controlled by 27.5", the durability of the product through body strength construction, required for school bus which far exceeds transit application, material used which is practically non corrosive.

Superior Body Model 6000 - G15120

Rear Engine & medical compartment with bench for
stretcher.

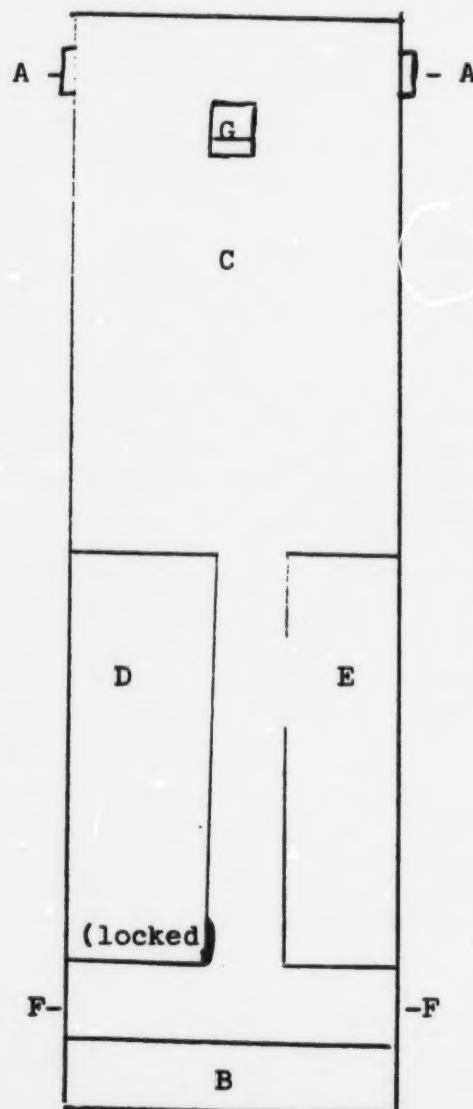
Right & left entrance door (manual)
Left & right rear side loading door
Special re-inforcement construction package
Entrance grab handles
Complete foam insulation
Wood floor over steel
Sanders
Step up bars for rear loading doors
Locks for rear doors
Two defroster fans.
Lamps - 2 front - 2 rear flashing 7"
Driver lamp
Strobe lamp
Marble rubber floor covering
Moulding cover for floor
Marble rubber for entrance stepwell
Special sunfire paint
Reinforced side snow rail
Standee rail
2 Convex 8" interior mirror
Driver seat - American seating
Deluxe passenger seat for 26 adults
Front power vent
Rear power vent
Interior deluxe luggage rack

SUPERIOR

Page 5.
February 10, 1983.
Mr. M. J. Bablic
Thompson, MB.

16 - double insulated windows in passenger compartment
2 - double insulated windows in baggage compartment
Entrance doors insulated windows
Four hot water heaters.

3). Interior division recommended. (Not to scale)



- A. Entrance door w/stepwell.
- B. Engine & stretcher with attendant bench, complemented with first aid equipment.
- C. Passenger compartment seating area
- D. Commercial baggage - entrance at rear.
- E. Passenger luggage compartment - access from aisle.
- F. 46" x 59" outside loading door.
- G. Inside bathroom facility.

SUPERIOR

Page 6.
February 10, 1983.
Mr. M.J. Bablic
Thompson, MB.

- 4). The following are optional equipment, which should be considered: --

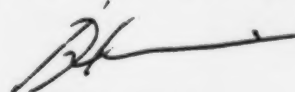
Interior paint substitution to materials
Luggage outside compartment
Roof rack
Padded modesty panels.
Interior shoulder pads.
Cowcatcher or snow blade
Air conditioning
Boiler for heaters
Camper back up heaters.

- 5). The conversion for rail use is approximately \$15,000.00, as per the attached internal memos. This could somewhat be higher, as per Mark's suggestion, to have the work sub-contracted by Greater Winnipeg Water Works.
- 6). The chassis and the body price with the options, as listed, is approximately \$85,000.00 to \$90,000.00, all taxes extra. We will require a final negotiation on the options and the requirement on the partitions, as proposed in no. 3. The cost could vary from \$2500.00 to \$10,000.00, which is not included in the above price for the partitions and listed options in no. 4.
- 7). The chassis is available and in stock and also can be viewed at our plant, as well as the body construction and the options that are listed.

The proposed package for the rail car, is to assure that local servicing is possible, through a product that is compatible to the highway units, that is presently being used in the Northern areas.

Please contact the writer, should you have any questions at all.

Very truly yours,



B.A. Sabourin,
Vice President - Marketing.

cc: Mr. W. Graham
Mgr. Passenger Policy Br.
Dept. of Highways
Mark Wilkins & Jim Seymour

SUPERIOR

SUPERIOR BUS MFG. LTD.

P.O. BOX 460,
MORRIS, MANITOBA, CANADA
R0G 1K0

PHONE: (204)746-2333
TELEX: 07-587802

February 7, 1983

MEMO TO: File

SUBJECT: Rail Bus, Greater Winnipeg Water Works

Ian Henderson
Engineer in Charge
Ph: 237-4203

Don Newton
Maintenance Supervisor
Ph: 233-1456

John Dyck
Mechanic

Winnipeg Hydro have converted several vans and road vehicles to run on rails. You can purchase rail tires, axles and differentials, brakes of the railway shoe type, actuated by the brake pedal in the cab and powered by separate vacuum units. "Winter tires are made by running a welding bead on the part of the tire that runs on the center of the rail. This breaks the ice which forms on the rails. Speed of 50 miles per hour are usual, 70 MPH is often achieved. It was also reported to me that the van which previously got somewhere between 10 and 12 miles per gallon in the city now gets 28 MPG on rail." The difference in rolling resistance seems unrealistic to me. We might recheck these calculations.

Greater Winnipeg Water Works would be interested in modifying one of our buses or also in purchasing one of these buses. They would likely build something similar to what they have, which is a separate frame under the vehicle with rail components for axles and tires. Price was not discussed. The author agreed to send Mr. Newton copies of the Hendrickson chassis, the Ford body builders books GM and Harvester body builders books and Superior Bus body along with a copy of the Rail Bus proposal. Water Works would then reply with a proposal to us.

Various methods of drive were considered. The author believes that John Dyck is a very capable fellow. Hydraulic drive was also considered and this would be Mr. Dyck's preferred approach. The Winnipeg Hydro conversion would be considerably more expensive than Arne's but also considerably better. It is my opinion that we should all prefer a fairly high quality product to insure the success of the project.

SUPERIOR

February 7, 1983

MEMO TO: File

SUBJECT: Rail Bus Comments

In my opinion, it would be best to provide a School Bus type body on a conventional 20 - 25,000 pound conventional or the Hendrickson or a Hino chassis.

Superior could also supply the Wescoach type body on an Oshcosh chassis. Special considerations that occur to the author are:

1. Some sort of fold up steps coming out of the door to allow for the extra height between the floor and the ground on a railway track. Most places would not have a station platform. On first consideration I would prefer the two axle system as opposed to the Bogie system and would opt for two not four wheel drive driven through an automatic transmission.
2. I would prefer the Greater Winnipeg Water Works approach to drive trains which is building a heavy sub-frame underneath the vehicle with fairly conventional looking rail components, which are coupled to the automotive systems.
3. I am somewhat uncomfortable with the hydraulic turntable concept on the longer wheel based vehicles, due to the lack of ability to predict the centre of gravity of the payload.
4. Vehicles should be equipped with two-way radio and dispatched by such.
5. A trailer could be added for excess baggage if required provided the baggage were not temperature sensitive.
6. There are two ways of providing extra or emergency heat.
 - (a) A diesel or propane fired boiler to heat the cooling fluid in the engine with a pump to circulate the coolant through the bus. This system would have the advantage of being able to keep your engine warm when operation of a block heater was not feasible due to lack of power.

- (b) The second choice would be the use of standard propane fired camper heaters which could be simply purchased and installed.
- 7. Both Winnipeg Hydro and Winnipeg Water Works clean the snow from just in front of the front trucks. The Hydro uses steel bristle brushes, while the Water Works uses rubber flaps.

SUPERIOR

February 7, 1983

MEMO TO: File

SUBJECT: Rail Bus, Arne's Welding

Depot: Arne Doucette
835 Mission Avenue
Ph: 233-7111

Bill Linton
Designer

Bill designed the unit for Winnipeg Hydro. The general approach to the problem was discussed. The Winnipeg Hydro vehicle cost \$10,000 when it was built in 1969. They would thing that they could modify one today for approximately \$15,000 remembering that the design is already done.

The approach would be for Superior Bus to build a conventional bus and drive it to Arne's Welding for conversion. Bill is of the opinion that four ordinary axles would allow the front wheels to fall between the rails, but surely you could simply limit it's movement. Any involvement with Arne's Welding would necessarily involve the use of a Pony Truck at the front, which would provide a design very similar to the one Winnipeg Hydro is currently running. NOTE: My comments on that vehicle. I promised to send Arne some preliminary drawings of the bus body and Hendrickson chassis and also a copy of the Rail Bus proposal.

SUPERIOR

February 3, 1983

TO: FILE

SUBJECT: RAIL BUS, WINNIPEG HYDRO

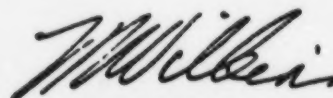
Jack Crawley
Winnipeg Operations
1-944-

Jack Lamb, Supervisor
Point du Bois
1-844-2357

Sam Dunwoody
Rail Bus Supervisor
1-844-2357

Point du Bois is a two and a half hour drive from Winnipeg towards Lac Du Bonnet. The reception I received was cordial and helpful. I obtained a copy of the specification they wrote in 1969 to purchase their Rail Bus. The vehicle is a 1969 Wayne body on a Ford chassis, about 20,000 pounds GVW. The vehicle was bought as a School Bus from Wayne, modified by Arne's Welding in Winnipeg. It has a small Pony truck at the front which is allowed to pivot through 13 degrees either way. The truck is fastened to the regular Ford road springs. Railroad type shoe brakes are actuated by a cable using the steering wheel as a windless. Rear wheels were customed machined and adapted to simply replace the Ford wheel rims. There was initially some trouble with this arrangement with the studs breaking. It was discovered that the fit between the studs and the wheel was not precise enough and the shock loads from the railway tracks fatigued the bolts. This was fixed by carefully match machining components and replacing the studs with high strength fasteners.

A second transmission was placed behind the original Ford unit allowing four speeds in each direction. The ride in the vehicle is quite high in lateral accelerations. Twenty miles an hour seems very fast. The noise levels are extremely high in general. The vehicle seems to be a very makeshift device. We also rolled on a much older vehicle which exhibited a much more pleasant ride characteristics. It is the authors opinion that this is due to the longer wheel base of this vehicle and its greater weight.



Mark Wilkins
Chief Engineer

APPENDIX V-c

MCI

Although MCI are not prepared to quote until there is something firm they did provide the following numbers:

Cost of new MC9 - \$165,000 (US)

Assume \$.81 Canadian \$203,703

Cost of conversion to rail

\$50,000

Type of conversion will have a major effect on the cost, however, it was felt that \$50,000 would be maximum.

Freight \$900

Subtotal: \$264,603

Contingency 26,600

TOTAL: \$291,203

Greater Winnipeg Water District
RAILWAY DEPARTMENT



I. F. Henderson.

OPERATING
RULES & REGULATIONS



MAY 1, 1972

5.52 Speed through turnouts must not exceed 15 miles per hour when turning out.

5.53 Before making running switches, stop must be made and brakes and switch tested. They must not be made with, or into, cars occupied by human beings or cars containing explosives or other dangerous commodities. Grade of spurs and sidings must be carefully considered.

SECTION 6

Rules for Movement by Train Order

6.01 For movements not provided by Time Table, train orders will be issued by authority and over the signature of the General Superintendent.

6.02 These must be brief and clear. Orders will be issued by radio when practicable, to the engineman or conductor of a train. When the radio is inoperative; orders must be received by telephone. The employee at St. Boniface designated as dispatcher will issue train orders. No train will enter the main line outside of Yard Limits without train orders. Orders must be specific and state definitely the point to which the train is authorized to proceed. This is essential to guard against failure of communications.

6.03 An Order shall state:

- (a) The number of the train and the direction in which train is operating.
- (b) The mileage and name of the point from which train is given clearance.
- (c) The mileage and name of the limiting point beyond which train may not proceed.

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(d) What other trains are 'on line' that may have to be met, overtaken or will overtake the train.

(e) The time in hours to 24, and minutes that the order is given.

(f) The initials of the receiving crewman and those of the dispatcher giving the order.

6.03.1 Running Rights are used to give a train (or the tampus etc.) the right to occupy certain specific sections of the main line for a certain specific time. Care must be taken to include in the distance specified, at least one point into which the train can clear. The train is required to obtain new orders, or to get into the clear before the time limit runs out. If communications fail, the dispatcher and other trains are entitled to assume that the work train is in the clear by the time his running rights have expired.

6.04 O.S. UNIT TO ST. BONIFACE

TRAIN No. ENG. No.

E. or W. BOUND ARRIVING Mile

..... Stn. Name

(to be given not more than two miles before O.S. or limiting point) AND REQUESTS CLEARANCE TO (if further orders are required)

6.05 The points at which an O.S. shall be given are:

Entering all yards.

M. 22 Millbrook, Mile 43 Junction.

M. 64 Hadashville, M. 80 Wye.

and in addition all limiting points.

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6.06 Should communications fail:

- (a) Each train may proceed to the limit of its orders where it will remain until new orders have been obtained or until one-half hour has elapsed.
- (b) As soon as the radio is found to be inoperative the Engineman or Conductor shall endeavor to obtain orders via M. T. S. phone, before his train has reached the limiting point in his orders.
- (c) If, after waiting one-half hour at the limiting point, the Engineman or Conductor has been unable to obtain new orders, he shall proceed at reduced speed to the first point from which orders can be obtained.

6.07 Train Movement Within Yard Limits: Trains working within limits of a yard will not require orders. However, they must upon leaving the train shed, advise the dispatcher of their intentions. This will serve as a check on the radio equipment and enable the dispatcher to advise other trains of their presence. Similarly, they must report to the dispatcher when a unit is put into the train shed. Entering a yard limit from the main line will be automatically reported by the 'O.S.' An order is required to enter the Main Line at any time.

SECTION 7

Instructions Governing the Use and Operation of Radio Sets

7.01 General: No radio shall be turned off at any time except as follows:

- (a) Head Office from 17:00K to 8:00K.
- (b) Mobile Units when unattended or shut down for service, etc.

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7.02 Mobile Units:

- (a) Operators of Radio Mobile Units shall report to Dispatcher when they first come on duty and thereafter each time they leave their vehicles and return to them during the day and when they go off duty.
- (b) In the event that a Mobile Unit is 'off the air' for a period in excess of one hour, the operator shall report to St. Boniface on the hour each two hours, unless he has reported himself accessible by phone or is required by his duties to be out of contact, in which case he shall so advise the Dispatcher.

7.03 Fixed Units: Each Operator of a fixed unit shall report to Dispatcher first thing each morning and last thing each evening.

7.04 Failure to contact any unit should be reported immediately to Dispatcher, who shall enter complete story in the log and if unit continues to be out of service, shall phone District's service man complete details.

7.05 No unnecessary use is to be made of the Radio System. Transmission must be as brief as possible. In the event that more than one unit desires to go on the air at the same time, the Dispatcher will have every preference.

SECTION 8

Regulations Governing the Use and Operation of Motor and Push Cars

8.01 In these rules the word "car" means any railway non radio-equipped vehicle that can be removed from the track by the crews accompanying it.

8.02 A car must not be operated on the railway without permission of the proper authority.

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APPENDIX VI-b

INCO Manitoba Standard
Radio Practice

SECTION FOUR

R.R. Radio Procedures

1. The dispatching of all trains will take place from the Scale House.
2. A radio log will be kept by each crew recording messages received. This log will be passed from one crew to the next as crews are relieved and will be turned in to the supervision on duty if no relief crew is on duty.
3. An identical log will be kept by the supervision on duty in the Scale House.
4. All instructions must be recorded in the log by both the recipient and the transmitter.
5. Instructions are to be kept brief, omit all formalities.
6. All instructions are to be read back by the recipient before acting on such instructions.

Example of Message:

#2 Loco: "#2 locomotive to Scale House-over"

S.H. "#2 locomotive, this is Scale House-over"

#2 Loco "Have loaded 25 cars of Soab ore, request permission to proceed to Thompson - Over"

S.H. "You have loaded 25 cars of Soab ore and request permission to proceed to Thompson - Over"

#2 Loco "Roger"

S.H. "Proceed to mile 24 and call for further instructions . #3 unit E.T.A. at Pipe 1:10 - Over"

#2 Loco "Will proceed to mile 24 and call for further instructions #3 unit E.T.A. at Pipe 1:10 - Over.

S.H. "That is correct. Out"

NOTE: Both will record the underlined portions of the messages along with the date, shift and time.

7. Permission must be received to:-
 - (a) Leave yard limits at Pipe, Soab or T-1.
 - (b) To enter yard limits at Pipe, T-1 or Soab.

- (c) To proceed beyond the limit of last instruction

Radio Black Out

8. If a radio black out occurs at Pipe, Soab or Thompson the crew will communicate with supervision by phone.

9. If radio black out occurs at a point between these terminals the crew will wait 15 minutes beyond E.T.A. before proceeding at restricted speed to the next terminal where they will phone the scale house. The crew having passed their block must continue to attempt to call the scale house on 5 minute intervals until contact is established.

Radio Terminology

Over: The word "over" is to be used at the end of each transmission, it means "my transmission is ended, I expect a response from you."

Out: Signifies "this transmission ended and no reply expected".

Radio Frequencies:

All crews will use channel 3 at all times when talking to the scale house.

35. Movements on all INCo trackage is under the direction of the Scale House.
36. Before any train leaves any yard limit he must first receive permission to do so from the Scale House.
37. Normal main line movements will be controlled by radio. (see radio procedures Section IV)
38. The length of fixed block will be determined by the dispatcher.
39. Moving blocks will not be less than 3 miles between units.
40. Moving blocks are established to move two units simultaneously over the same section of track in the same direction. For example: 2 trains are moving south from Thompson to Pipe, the leading train is given a block from Thompson to Pipe yard. The trailing train may be given a moving block from Thompson to Pipe three miles behind the leading engine. This is achieved by the leading engineer reporting his location to the Trailing Engineer as he passes each mile board and having the trailing unit acknowledge the receipt of such information. If a radio blackout occurs the leading engine must continue to the end of his block. The trailing train not having heard from the lead train as he reaches a new mile board may continue decelerating to restricted speed before reaching a point one mile from the last point of contact with the leading train. He then may continue at restricted speed to the end of the moving block. Normal speed may only be resumed

if radio contact is established with the leading engine or permission to do so is received from the Train Dispatcher. Both engineers must establish contact with the Train Dispatcher by radio or phone as soon as possible for further instruction and to inform of the radio failure.

(BRITISH RAIL RESEARCH BULLETIN GM 1162/B7/1221)

(Rec'd June 82)

Radio Link System for Single Line Signalling Installations

APPENDIX VI-c

In many parts of the world the safety of trains on single line railways is ensured using electro-mechanical machines to release only one 'token' or authority to drive over the line, at a time. The principal disadvantage of token machines lies in the necessity for a direct electrical line connection between the two ends of a single track section, as this represents a considerable maintenance burden, particularly where the line wires are prone to damage by bad weather or vandalism.

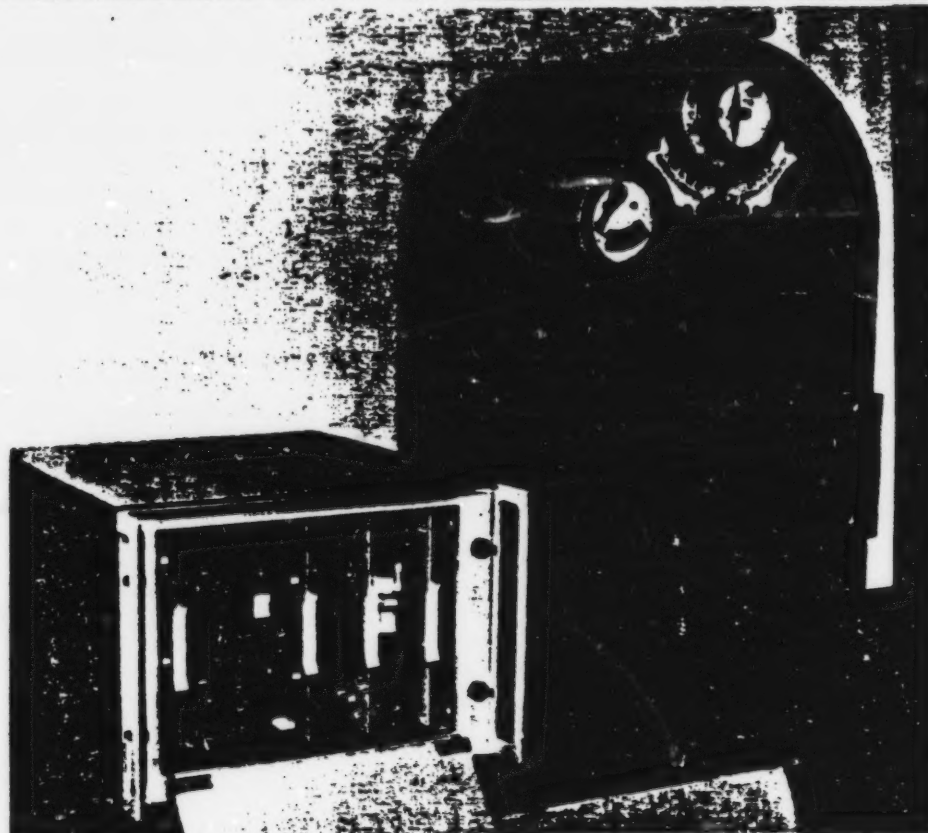
The increasing existence of radio installations for communication with train crew and maintenance staff makes it attractive to propose the use of a radio network for the transmission of bell codes and release signals between block instruments.

British Rail's Research & Development Division has developed a system which enables a vhf radio network to be used with token signalling installations which requires little modification and retains full compatibility with speech transmission and selective calling equipment.

Principles of Operation

The security afforded by single line token equipment lies partly in the bell codes and procedures used by the signalmen but mainly in the electrical and mechanical integrity of the instruments which are designed so that only one token may be released for use at any one time. The vital information transmitted from one instrument to the other is the polarity of the electric current which flows when the signalsman operates the push-button or plunger that operates the bell on the distant instrument. The task to be performed by a radio control unit is mainly to transmit polarity and bell code information from one site to the next with the high degree of security demanded for railway signalling.

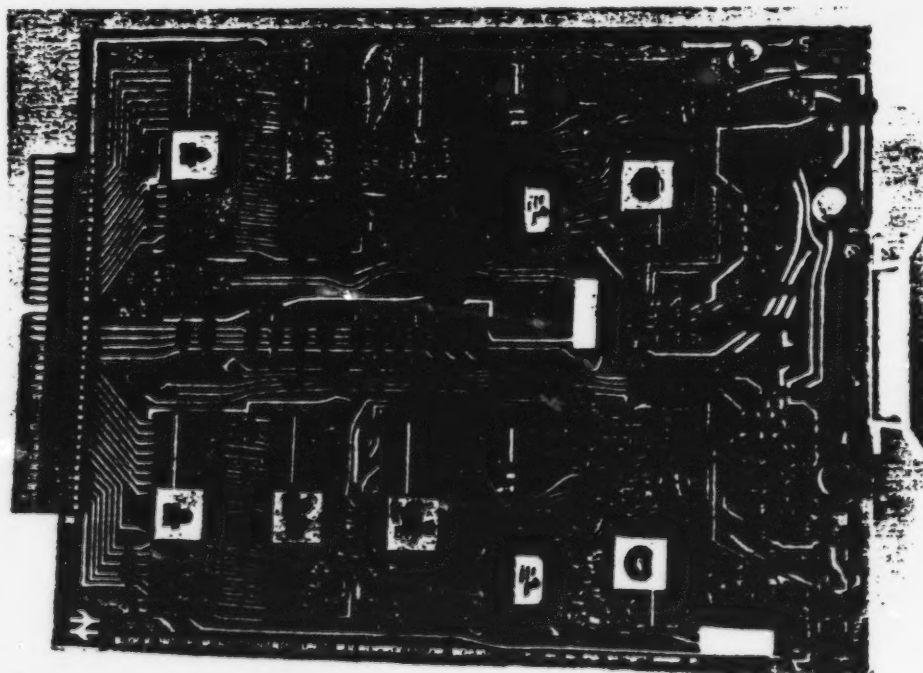
(Fig. 1)
Control Unit module
standing alongside
a typical single
line block token
instrument



- 98 -

The Control Unit consists of four circuit boards housed in a compact free standing case (Fig. 1). The circuit boards carry power supplies, a power disabling device, token instrument interface circuitry, a modulator-demodulator, and a duplicated microcomputer (Fig. 2) which performs all the logic functions associated with the correct and safe operation of the unit. The power disabling device and 'redundancy management' circuitry associated with the microcomputer are designed to ensure failure of the equipment to a safe state in the event of an internal fault.

(Fig. 2)
Block Instrument
Control Unit
Microprocessor Board
Identical
microprocessor systems
on each half of the
board ensure the
safety levels required
for railway signalling



(Fig. 3)
Single line section
with radio linked
token signalling
equipment

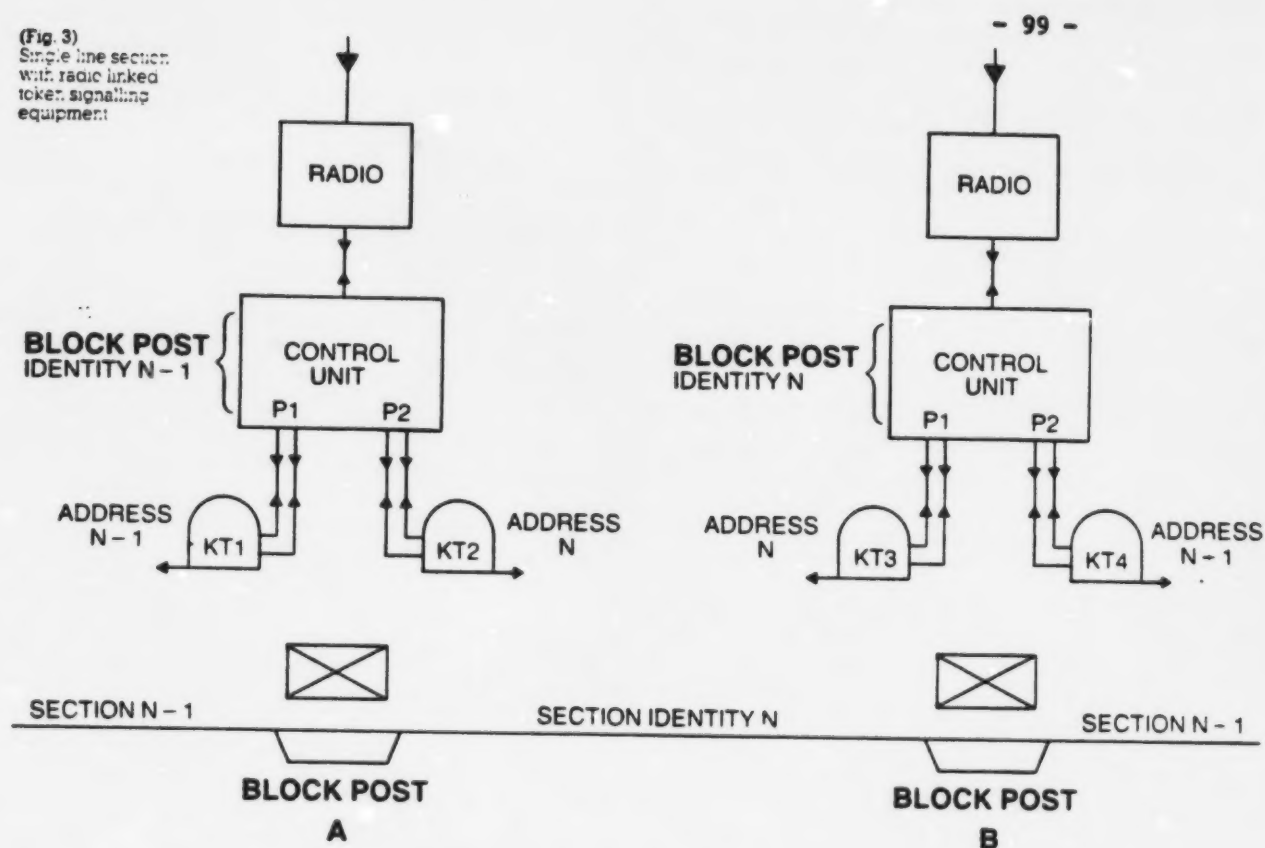


Fig. 3 shows a section of single track between two block posts A and B. Each post is provided with a radio transmitter and receiver, two key token instruments, a control unit, and has a numerical identity coded into its fixed wiring. This code is read by the control unit and must be unique within the radio network. Each control unit has two pairs of connections to token instruments, P1 and P2, and the relationship between the block post identity and the address associated with each pair is defined in the diagram. It will be seen that the instruments at either end of a block section share the same address which may be regarded as the identity of the block section.

In operation the signalman enters his bell code in the normal fashion, and a record of his action is formed within the control unit. When no further information has been entered for a short time the record is considered complete and is assembled into a coded message, together with the instrument address and information about the polarity. The message is transmitted as a frequency shift keyed (FSK) modulation of an audio frequency carrier, and is subsequently received at all other block stations. Only the relevant signal box will recognise the message address and reproduce the bell code with the correct polarity at the appropriate instrument. All other signal boxes will ignore the message.

A control unit can operate its two block instruments completely independently of each other. Message transmissions are typically very short, and are able to take advantage of gaps in voice transmissions. Strategies are applied to minimise the risk of loss of transmission due to conflicting use of the radio network.

Radio System Requirements

The equipment is suitable for use with any voice grade radio network capable of satisfying modest group delay distortion requirements and providing adequate signal to noise performance for data transmissions. In many cases the system can be added to an existing radio network. Small modifications to block post radio equipment are required to provide audio frequency connection to the control units, and modification of all mobile and portable units to prevent interruption of data transmissions is desirable.

Installation on British Railways

The system developed by British Rail Research has been installed at eight locations covering 103 miles of the Inverness-Wick route of British Rail's Scottish Region. The area is covered by a mid-band vhf radio system having a number of base stations linked by a uhf network to a control centre at Inverness.

Further Information

Further information can be obtained from:

Commercial Manager
British Rail Research and Development Division
Railway Technical Centre
London Road
Derby, England
DE2 6UP
Tel. Derby (0332) 49203

Kings Cross and St Pancras suburban electrification schemes embracing computer-controlled discreet speech-link between driver/signalman so avoiding distraction to others but with emergency call procedure provided. - 101 -
Techniques applied to combat signal strength deterioration in tunnels and cuttings

Service operation of driver-signalman discreet radio speech-link on latest North London BR suburban electrification

APPENDIX VI-c

The benefits of a continuous communication system have been appreciated on British Railways for several years. Service trials of inductive-loop systems have been made but the cost and problems associated with the reliability of cables laid down between the track have led to their development being shelved for the GN and St Pancras suburban electrification schemes in favour of radio communication.

Radio communication enables trains to be called at any time and likewise permit the train crew to call the signalman without having to use a lineside telephone. Also, the driver can obtain technical advice from his depot direct using the BR trunk-dialling telephone network, using the signalman's radio-to-telephone connect facility.

It is important therefore to report that BR decided to go forward with such a radio communication system on two of the latest suburban networks in the London area, the Great Northern suburban electrification scheme into Kings Cross and Moorgate on the Eastern Region which went into service with the winter services of 1976, and the St Pancras 'Moorgate to Bedford' scheme which will be partially inaugurated in 1982. In the case of the GN scheme, radio installation on trains is planned to start in November 1981 and in the case of the LMR suburban scheme with the introduction of the electric service.

The radio system adopted conforms to the UIC Specification 751-3 and, except for the particular ultra-high frequencies used, is compatible with systems on other European railways. The GN scheme uses a dual-computer system at Kings Cross signalbox to control the selective calling and security of each cell. The computer stores a train list which correlates the train stock number with the train running number. To verify the integrity of the complete fixed system a self-check routine is initiated and monitored by the computer every two minutes.

The radio system and data telegram format was developed originally by AEG-Telefunken GmbH in conjunction with the German Federal Railway (DB) and has been adopted for international use. The application of a dual-purpose for this system however, is a new development made.

Lineside conditions affecting transmission

However, certain line-side conditions and track locations considerably affect transmission efficiency, that is tunnels, over-bridges, and cuttings. On the GN line, the 4 km single-bore mainline tunnels, those on what was formerly the London Transport North London line into Moorgate, and on the St Pancras-Bedford scheme, the 'widened lines' passing beneath Kings Cross Station and running into further tunnel between there and Farringdon, certainly necessitated particular attention the GN line this has been met by one-way repeater radiating-cable. The LMR 'widened lines' twin-track tunnels and others on

accommodated by Yagis antennae mounted on the tunnel mouths, except for the 2.5 km Ponsbourne tunnel which has Yagis installed mid-way also.

The major cutting approaching Kentish Town on the LMR, and that 5 km beyond Hronsey on the GN have each been equipped with a local transmitter aerial, even at 40 m above ground level being unsatisfactory. With respect to over-bridges, these produce a fall of from 12 to 15 db, but as it is a local deterioration in signal intensity, this has been accepted.

On the GN scheme the radio system is divided into four areas, each controlled by a signalman in the box at Kings Cross. Radio coverage is by 17 fixed stations. In addition a radiating-cable system is applied in two 'Tube' tunnels, each fed by a central transmitter with receivers at the extremities.

On the LMR a total of 19 fixed stations will give the coverage of the 85 km route. Four of these for the 'widened-lines' tunnel section, and five others at tunnel mouths to give coverage both into and away from the tunnels. There are four signalmen's areas in the new West Hampstead signalbox, which is presently being commissioned, each of which will form a control area for the radio system.

Control is derived from a dual Argus mini-computer, the two parts being operated in a main live standby mode. All data exchanges and speech circuits are controlled by the computer. The signalman's panel incorporates a full alpha-numeric keyboard to address the computer and to enter train codes and preset messages; a visual display unit to monitor and display messages received from and transmitted to trains, and to display the train list providing correlation between the 'running number' and 'stock number' of trains in the system; facilities to connect the radio system to the BR telephone network. The panel also shows with a series of indicator lamps, the state of the fixed-radio network. Trains are identified to the signalman by running number which corresponds to a particular journey in the timetable.

The train descriptor computer system in the signalbox, displays on a numeric diagram the running number of each train and updates its location as the train progresses. The constant feature of any train, which is also used as its call sign, is the stock number. Correlation between these two numbers is established in the computer controlling the radio system and this is initiated by the driver at the start of a journey. A list of stock numbers and running numbers is maintained and updated by reference to the train descriptor system.

Trials started in October 1979, initially using a road vehicle, and then with an electric multiple-unit with prototype radio equipment on the GN scheme. These have been very successful, no wrongside failures being recorded, although the success rate on data message exchanges at 99% is lower than expected. The reasons for this are being examined, with the two causes suspected being: first, software errors in the main computer unit;

Rd. Engineering Unit
NW 1.1.81, V1013
PFC 20-84

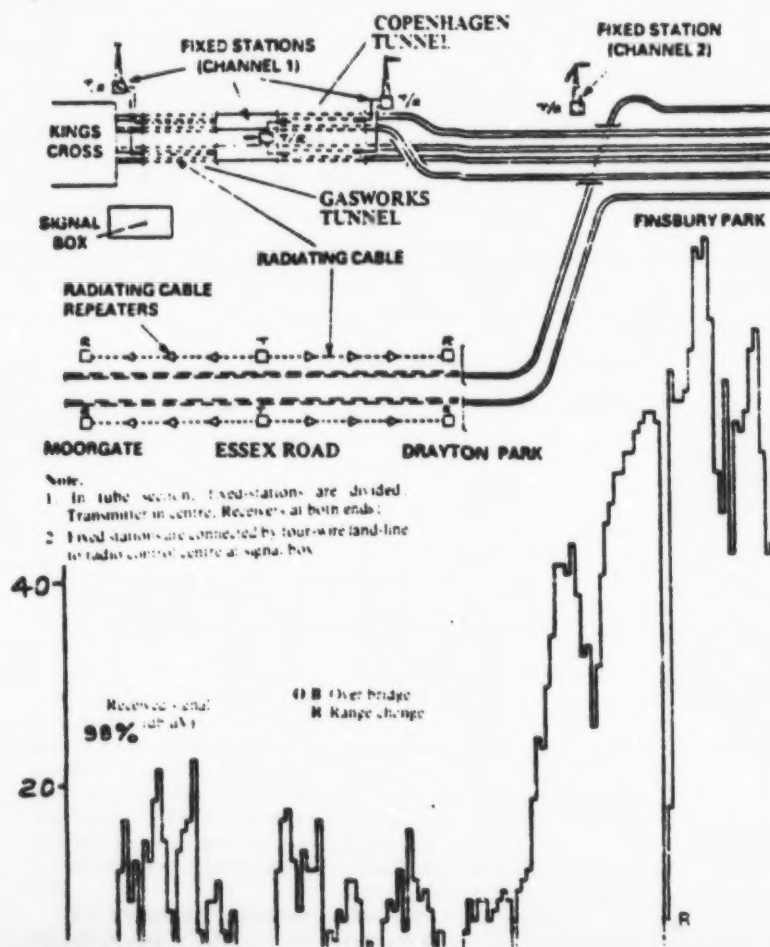
interference from some other radio source. Control tones are being detected 100% reliably, so that emergency and general calls are always successful. The self checking system for lineside fixed-stations is working correctly.

Pilot scheme inaugurated on ER Kings Cross suburban lines

Of the two London suburban electrification schemes, the GN inner-suburban electrification was chosen for the pilot signalman-train radio communication scheme. It covers 62 route km and embraces 10.6 route km of tunnel which includes the pair of 4 km single-bores between Moorgate and Drayton Park. The track is covered by a free-space propagation system using 12-element Yagi antennae mounted at various heights depending on the range required.

The requirement for complete coverage, and reduce annoyance effects of electrical interference, the mobile squelch has been set at the relatively high level of 2 V. Surveys are carried out by a specially-equipped test coach which takes measurements at every 12 cm intervals when running at 112 km/h (30). The received signal is analysed and a graphical output then produced of the 98% signal level for each 50 m block (Fig 1). In open country a 30 m tower with a 12 element Yagi pointing in each direction at 25 W e.r.p. gives about 8 km coverage. Yagis have been used not primarily to increase the signal level along the track but to reduce the spill-over on to other parallel routes so permitting re-use of radio channels.

Fig 2. Fixed radio system. Kings Cross Moorgate-Finsbury Park, Eastern Region BR.



From Fig 1, the 10 < 15-dB fall in signal level by an overbridge will be noted. Likewise the rising signal caused by embankments can cause problems if over-spill is experienced from another transmitter on the same frequency. Also, the very rapid attenuation of the signal by tunnels which require local provision. Likewise to be noted is the affect of a local obstruction such as a hill in the northward direction, which can cause rapid attenuation of the signal. The line then curves so as to re-appear from behind the obstruction and the overall coverage is still acceptable but show well the criterion to be used when siting fixed-stations.

Meeting conditions in tunnels

That this line has many tunnels has already been mentioned. Looking at the section Kings Cross and Moorgate to Wood Green in Fig 2, coverage is obtained in one of three ways mentioned. Coverage of the Moorgate to Drayton Park section 4 km single-track tunnels is by one-way repeated radiating-cable system (4) with central transmitters at Essex Road and receivers at Moorgate and Drayton Park. The repeaters designed by BR Research & Development Division, are spaced at 500 m intervals and of 10 mW output power. These amplify both the transmit signal to the train and also that from the train so that it can be passed to the receivers. The ex-LT 'tube' tunnels give little clearance which necessitates a third-rail conductor being used instead of the 25 kV overhead applied in the open. This precludes the radiating-cable being placed in the ideal position above the train and therefore it is suspended on hangers at the side of the tunnel. In Gasworks Tunnel, radiating-cable is used connected to a transmitter receiver in Kings Cross signalbox which is also connected to an antenna to cover the station area. In all other double-track tunnels, horizontally-polarised Yagis mounted in the tunnel mouths to launch a signal into the tunnel, whilst aerials are also mounted midway in the Ponsbourne Tunnel.

Fig 3 shows a typical result obtained by the test coach using both horizontally-polarised and vertically-polarised but the mean attenuation is lower. The presence of another train in the tunnel is found to cause a rapid fall in signal but it returns to the original rate of fall once the blocking train is passed.

Fig 1. Propagation of radio signal in open country. The local fall-off in signal strength by over-bridges, tunnels and cuttings will be noted

Computers control

Control is derived from a dual Argus mini-computer, the two parts being operated in a main live standby mode. All data exchanges and speech circuits are controlled by the computer. The signalman's panel incorporates:-

- a full alpha-numeric keyboard to address the computer, and to enter train codes and preset messages:-
- a VDU to monitor and display messages received from and transmitted to trains, and display the train list providing the 'running number' and 'stock number' of trains in the system:-
- facilities to connect the radio system to the BR telephone network:-
- a series of indicator lamps showing the state of the fixed radio network.

The train-describer system in the signalbox displays on a mimic diagram the timetable running number and updates the location as the train progresses.

The constant feature of any train is its stock number which is used also as its call sign. Correlation between this and the running number is established in the computer controlling the radio system and this is initiated at the start of the journey by the driver. A list of stock numbers is maintained and updated by reference to the train-describer system. The radio is well proved in

railway service having been used on DB for some years. The operating frequency is in the band 440 to 460 MHz and the RF frequency is 10 W. The specially-developed processing unit is based on a micro-processor to control the radio and audit circuits and to generate and check data telegrams. A serial data link passes between the driver's panel and the processing unit. Power is supplied from the train 110-V auxiliary supply through a power-supply unit which acts also as a surge-suppressor. The radio is interfaced with existing train intercom system to give the guard and direct public-address facility from signalbox to passengers.

Signalman-driver conversations

To minimise misunderstandings and avoid distraction to the driver it is considered necessary that the signalman-driver conversations are not overheard by other drivers. Security of the radio system is therefore obtained by two separate but inter-related methods. The first is that the overall state of the system in each signalman's area is determined by four control tones, and secondly, the traffic is controlled by individually-addressed telegrams. The four tones in each area are: Line free; Mobile pilot; Emergency interrupt and General call. The traffic control telegrams are 43-bit data telegrams which individually address or identify train radios and a successful data exchange must precede all normal speech transactions.

'Line-free' tone is radiated by the fixed network when the system is not in traffic. When a train initiates a call, 'Mobile-Pilot' tone is transmitted from the train which serves to connect the most effective fixed-station receiver to the central line and switches off 'Line-Free' tone at the radio control. The absence of 'Line-Free' tone

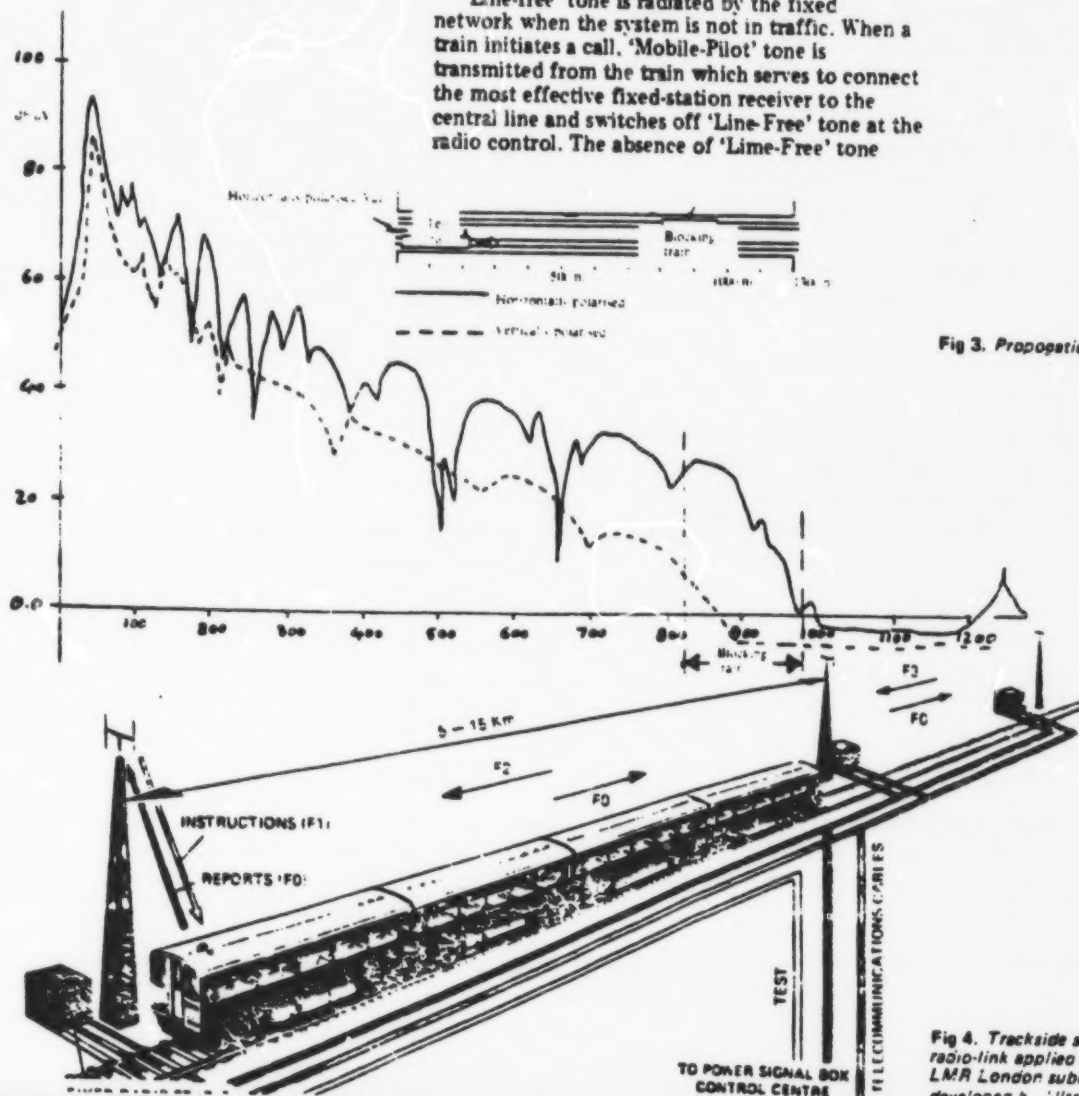


Fig 3. Propagation in tunnels.

Fig 4. Trackside schematic of radio-link applied to ER and LMR London suburban scheme; Haulman & Hore Electronics

Train radio will blanket Netherlands Railways

THE Board of Netherlands Railways decided in principle on November 1 to equip the entire 2 880 km network with train-to-signalbox radio over the next five years. About 160 radio base stations and 2 200 on-train radio sets will be needed.

Telerail, as it is known, will be a closed full-duplex system conforming to UIC leaflet 751-3, and therefore compatible with the neighbouring DB train radio network. Calling is selective, and

once a speech link has been established other radio sets are locked out and can neither listen to nor interrupt the conversation.

An electronic security code gives the dispatcher positive identification of the train he is speaking to, and codes will also be available to transmit messages such as emergency alarms. Track maintenance staff working on the line and carrying portable radios will also be able to speak directly to train drivers in their vicinity.

NS is gradually implementing a plan under which control of the network will be exercised from about 20 large signalling centres, and these will be the points from which the radio networks will be controlled. Though not replacing signals, radio will be available as back-up. Its normal functions will be to assist in regulating the flow of trains, to keep passengers informed about delays, and to discourage vandalism.

Strathclyde gives go-ahead to £80m Ayrshire electrification

A £7.5m grant from the European Regional Development fund has allowed Strathclyde Regional Council to approve a 60 route-km electrification scheme linking Ayr and Ardrossan to the existing 25 kV 50 Hz suburban network serving Glasgow. The connecting line in Glasgow between Shields Junction and Corkerhill carriage sidings will also be wired to facilitate rolling stock movements. Strathclyde will meet the £25m cost of electrification as part of an £80m package which includes signalling and track alterations as well as new and refurbished trains.

Target date for completion is May 1987, and tenders will be called early next year for bridge reconstruction between Paisley

and Ayr, and on the short branch from Kilwinning to Ardrossan. Erection of the catenary, however, will await completion of track simplification and resignalling. No decision has been made on the future of the line from Ardrossan to Largs, but closure is being considered.

A new signalbox is to be built at Paisley which will take control of the newly-electrified routes to Ayr and Ardrossan as well as the lines to Gourock and Wemyss Bay electrified in 1967. BR will meet the cost of this work.

Eleven three-car EMUs similar to the Class 317 four-car sets supplied in 1981-82 for the London-Bedford electrification will be built, and a refurbishing programme for the Class 303 and 311 EMUs built for Glasgow



suburban services in 1959-67 will be started with the aim of raising their maximum speed to 145 km/h. A grant from the Secretary of State for Scotland will meet 75 per cent of the cost.

Nine year rebuild for Liverpool Street

BRITISH Railways Board has approved detailed plans for a £260m reconstruction of Liverpool Street station as part of a commercial development to be undertaken by a consortium including Taylor Woodrow and Wimpey.

Outline planning permission for the scheme was granted in 1979, and bills are now before Parliament to allow BR and London Transport to carry out the necessary railway works. Permission to close Broad Street station has been sought from Transport Secretary David Howell.

Work on the 25 acre site is expected to start during 1983 when detailed financing agreements are settled. The first phase will involve demolition of Broad Street station to make room for the property development.

Liverpool Street itself is to be reconstructed during 1986-90, when the platforms will be realigned, lengthened and increased in number from 18 to 22. Two additional approach tracks will be laid inwards from Bethnal Green, together with improved crossover connections.

North London line trains will use a temporary station at Worship St for six years until diverted to run into Liverpool Street via a new curve at Graham Road, Hackney.

Shinkansen opening precipitates timetable shake-up

JOETSU shinkansen services began running on November 15 between Omiya outside Tokyo and Niigata. At the same time more super express services were introduced on the Tohoku shinkansen to Morioka opened on June 23.

Timetables on JNR's 1 067 mm gauge lines to Niigata and Morioka have been completely recast to feed into the shinkansen network and eliminate services that would be duplicated. The timetable revision has also been designed to cut manpower by up to 10 000 jobs.

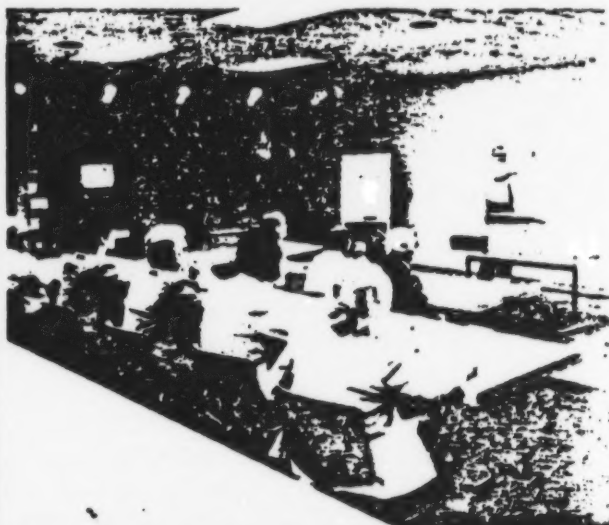
There are now 357 shinkansen services a day — 255 on the Tokaido and San'yo lines. 60 on

ordinary express services. There are 50 more limited expresses than in October 1981, but 226 fewer ordinary expresses. This reflects a policy to reduce the number of ordinary express trains, some of which have been upgraded to the limited category and others downclassified to local train status.

Compared with October 1981, shinkansen train-km have jumped by 35 800, but there are 57 600 fewer train-km on 1 067 mm gauge lines.

From November 15 the frequency of shuttle trains between Omiya and Ueno was stepped up to match the higher number of shinkansen arrivals and departures at Omiya.

Coinciding with the passenger changes, JNR revised its freight timetable. Emphasis is concentrated on improving container and wagonload



General Electric opened on October 13 adjacent to its works in Erie, Pennsylvania, a training school for the use of its own employees as well as railway customers. The \$6m building includes lecture halls, classrooms, laboratories and a shop.



GREY GOOSE

GREY GOOSE BUS LINES LTD. 301 BURNELL STREET WINNIPEG, MANITOBA R3G 2A6 (204) 786-8891

March 7, 1983

Mr. M. J. Babulic
Superintendent of Traffic & Transportation
INCO Limited
Thompson, Manitoba

Dear Mr. Babulic:

Re: Rail/Bus Proposal for Northern Manitoba

We are pleased to supply bus road operating information which hopefully will help the Canadian Transport Commission to make a positive decision regarding the Rail/Bus Proposal for Northern Manitoba.

The information is based on current and estimated 1983 company road operating costs within Manitoba, including northern Manitoba points: Thompson, Lynn Lake, Gillam, Flin Flon, Wabowden. Should your proposal require cost estimates for 1984, then we would recommend that approximately seven percent be added. Capital costs for garage facilities and bus purchases have been excluded.

Our cost analysis represents the most accurate statistics currently available. They are as follows:

1. Garage Facility Costs: = 5¢ per mile
(Garage facility costs include heating, all utilities, taxes, repairs, snow clearing, supplies; whatever it takes to operate garage facilities. All such items have been included.)
2. Maintenance Costs: = 31¢ per mile
(This item includes all mechanic and direct supervisor wages, benefits, employee supplies [eg. coveralls], all parts purchased for buses, all repairs done, tire costs, all bus operating supplies.)
3. Bus Operating Costs: = 41¢ per mile
(This item includes diesel fuel, all oils, license and insurance, mobile telephones, first aid, washroom supplies, paper towels, AM/FM radio cassettes, tools, etc., - all items required to operate a bus.)

The total operating costs per mile for these three categories is 77¢ per mile.

Mr. M. J. Babulic
INCO Limited
March 7, 1983
Page 2

4. Bus Driver Operating Costs: = 46¢ per mile
(We supply this information to indicate what our estimated Manitoba bus driver operating costs will be for 1983. It is our opinion that bus driver costs should perhaps be budgeted on a daily basis instead of a mileage basis.)

Major dollar saving advantages in maintenance and operating costs will result for the rail/bus concept. They are not reflected in the above operating cost figures, but have been briefly summarized:

1. Tire Costs:
Tire costs will be eliminated. This should result in a saving of approximately 3.5¢ per mile, plus labour costs related to tire changes.
2. Exterior Rail/Bus Washing:
This will be considerably less for the rail/bus concept as compared to our company's existing requirements for road operations.
3. Windshield and Glass Breakage Due to Road Hazards:
This will be much less, or will be eliminated almost completely, when compared to a road bus operation.
4. Suspension Damage Due to Road Conditions:
The maintenance and part replacements will be less than one-half that of the road bus operations experience.
5. Road Salt Problems:
This will be eliminated completely. Salt creates tremendous wear and tear on the bus vehicle under the road bus operations.
6. Brake Life:
This will improve to twice the life presently experienced on the road bus operation. This is our estimate. Design and installation will determine actual brake life expectancy.
7. Steering Mechanism and Maintenance:
All related operating costs such as safety inspections, repairs, and part replacements will be eliminated for the rail/bus operation.
8. Road Dust, Mud, and Slush:
The operating savings will have a significant impact on the wear and tear of the rail/bus concept when compared to a road bus operation. The greatest impact will be on

Mr. M. J. Babulic
INCO Limited
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the operating length and/or life of the power train assembly: the diesel engine, the alternator, the electric motors, the transmission, and the rear end. These items will operate much more efficiently on the rail/bus concept.

9. Diesel Fuel:

The rail/bus concept should operate more efficiently on a cost per mile basis than the present road bus operation costs. The savings here should be significant. Presently the average miles per gallon over our total fleet is 7.4 miles per gallon. The rail/bus operation should average between 10 to 14 miles per gallon, depending on the basic components installed when the rail/bus is built. The energy cost saving impact feature on this item alone is a major factor for long term energy conservation, efficiency, and operating cost funding.

The items above represent some of the attractive features which become obvious when studying and considering the rail/bus proposal. No doubt other items will surface for consideration. However, we have not concluded our detailed analysis of every possible operating efficiency and potential saving. Nevertheless, a rail/bus operation will certainly be more simple to operate when compared to a road bus operation. It would be easy to identify every detailed cost on the rail/bus operation over a period of a few months or even a year. Then accurate detailed budgeting could be done to determine long term funding if funding was still necessary after the first year.

One rail/bus operator should be able to handle the passengers and express if this is what you contemplate. Thompson connections with our existing bus services throughout all parts of Manitoba would appear to be a rather obvious advantage resulting in an efficient and practical intermodal concept. The rail/bus concept would appear to require capital funding so that an effective and meaningful project evaluation could be undertaken. The revenues could possibly cover operating costs after the first year.

We take the liberty to add our subjective comments in this paragraph. If the rail/bus proposal wishes to address modern transportation needs for the 1980's and 1990's, then we would hope that the rail/bus committee would consider the advantages of a modern intercity highway bus, instead of perhaps contemplating a van or school bus concept.

Mr. M. J. Babulic
INCO Limited
March 7, 1983
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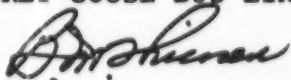
Clearly, our above cost estimates and observations are based on a rail/bus vehicle comparable to a modern highway bus. The garage facility costs will be determined by the size and/or equipment installed in such a facility. One supervisor or manager, one or two rail/bus operators, and a part time mechanic should look after the basic operation. Perhaps one or two officials monitoring the vehicle and/or the operation could handle easily the whole "study", result, reporting, evaluation, recommendations. Finally, the rail/bus operation costs will be determined by the qualitative specifications of the vehicle chosen.

It becomes strikingly apparent that the rail/bus concept will be workable, fairly simple to operate, cost efficient when compared to a road/bus operation; will be a worthwhile and relatively inexpensive pilot project which could serve a very important transportation need to the indicated communities.

Our company considers it a privilege to be requested to supply up-to-date, current information regarding the road bus operating costs. We encourage a positive decision. We trust that the information supplied will be of some value to your committee. Confidentiality, beyond that of the committee members, would be appreciated.

Yours very truly,

GREY GOOSE BUS LINES (MANITOBA) LTD.



Bernard M. Thiessen
President

BMT/im

SCHEDULE A-1 OF BOARD ORDER 30/82

INTRA-PROVINCIAL BUS EXPRESS SPECIAL CHARGES
AND SHIPMENT LIMITATIONS

W E I B H T I N P O U N D S

CHARGES ARE IN CENTS PER SHIPMENT

Miles	0-2	2-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	Over 100
25	225	325	325	345	355	365	375	380	385	390	390	390
50	325	350	365	380	395	405	415	420	440	450	450	450
75	330	365	385	405	425	445	460	475	495	510	510	510
100	335	370	390	410	435	460	480	505	525	550	570	570
125	340	375	395	415	440	465	490	515	535	565	630	630
150	345	380	400	420	445	470	495	520	545	570	690	690
175	350	385	405	425	450	475	500	525	550	575	710	750
200	355	390	410	430	455	480	505	530	555	580	715	810
225	360	395	415	435	460	485	510	535	560	585	720	870
250	365	400	420	440	465	490	515	540	565	590	725	930
275	370	405	425	445	470	495	520	545	570	595	730	985
300	375	410	430	450	475	500	525	550	575	600	735	1045
325	380	415	435	455	480	505	530	555	580	605	740	1105
350	385	420	440	460	485	510	535	560	585	610	745	1165
375	390	425	445	465	490	515	540	565	590	615	750	1225
400	395	430	450	470	495	520	545	570	595	620	755	1285
425	400	435	455	475	500	525	550	575	600	625	760	1345
450	405	440	460	480	505	530	555	580	605	630	765	1405
475	410	445	465	485	510	535	560	585	610	635	770	1465
500	415	450	470	490	515	540	565	590	615	640	775	1525
525	420	455	475	495	520	545	570	595	620	645	780	1585
550	425	460	480	500	525	550	575	600	625	650	785	1645
575	430	465	485	505	530	555	580	605	630	655	790	1705
600	435	470	490	510	535	560	585	610	635	660	795	1765
625	440	475	495	515	540	565	590	615	640	665	800	1825
650	445	480	500	520	545	570	595	620	645	670	805	1885
675	450	485	505	525	550	575	600	625	650	675	810	1945
700	455	490	510	530	555	580	605	630	655	680	815	2005
725	460	495	515	535	560	585	610	635	660	685	820	2065
750	465	500	520	540	565	590	615	640	665	690	825	2125
775	470	505	525	545	570	595	620	645	670	695	830	2185
800	475	510	530	550	575	600	625	650	675	700	835	2245

Effective Date: January 15, 1983

1. Flowers (cut flowers or floral pieces in cartons) regular express rate plus a surcharge of eighty-five (85¢) for each shipment.
 2. Collect Shipments will be subject to a forty cent (40¢) service charge.
 3. All Lot Shipments will be limited to five (5) pieces on any one bill of lading.
 4. Except as provided below, no single package shall be accepted that is over twenty-four (24) inches in height, forty (40) inches in width or eighty-four (84) inches in length. The weight of any articles must not exceed one hundred and fifty (150) pounds.
- Exception: Shipments of commodities listed below will be accepted with articles in excess of the limitations as to size (but not weight) specified above but shall be subject to a charge of two (2) times the regulation rate for such shipments as set out in Schedule A-1:

- (a) Automobile tires, bumpers, doors, exhaust pipes, fenders, grills, mufflers (when attached to exhaust pipes), panels, tail pipes (exhaust);
- (b) Glass products such as windshields, glass panes and television picture tubes.

Value Limitations

No single shipment shall be accepted exceeding five hundred (\$500.00) dollars in declared value.

SCHEDULE A-2 OF BOARD ORDER 30/82

INTRA-PROVINCIAL BUS EXPRESS SPECIAL CHARGES
AND SHIPMENT LIMITATIONS

SCHEDULE A(2)

BOARD ORDER NO. 30/82

WEIGHT IN POUNDS

CHARGES ARE IN CENTS PER SHIPMENT

Weight	0-2	2-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	Over 100
25	340	350	370	380	390	400	405	410	420	420	420	420
50	345	360	375	390	405	420	435	445	450	460	480	480
75	350	365	390	415	435	455	475	490	510	530	545	545
100	355	375	410	435	465	490	515	540	565	585	610	610
125	360	385	425	460	490	525	555	585	615	645	675	675
150	365	395	440	480	520	560	595	635	670	705	735	735
175	370	400	455	505	550	595	635	680	720	760	800	800
200	375	410	470	525	580	630	680	725	775	820	865	865
225	380	420	485	550	605	665	720	775	825	880	930	930
250	385	425	500	570	635	700	760	820	880	935	995	995
275	390	435	515	590	665	735	800	865	920	995	1055	1055
300	395	445	535	615	695	770	840	915	985	1050	1120	1120
325	400	450	550	635	720	805	880	960	1035	1110	1185	1185
350	405	460	565	650	740	825	905	985	1060	1140	1220	1220
375	410	470	580	670	760	845	925	1005	1080	1160	1240	1240
400	415	480	595	690	780	865	945	1025	1105	1185	1265	1265
425	420	490	610	710	805	890	970	1050	1130	1210	1290	1290
450	425	500	625	730	825	910	990	1070	1150	1230	1310	1310
475	430	510	640	750	845	930	1010	1090	1170	1250	1330	1330
500	435	515	650	760	855	940	1020	1100	1180	1260	1340	1340
525	440	520	665	775	870	955	1035	1115	1195	1275	1355	1355
550	445	525	680	790	885	970	1050	1130	1210	1290	1370	1370
575	450	530	695	805	900	985	1065	1145	1225	1305	1385	1385
600	455	535	710	820	915	1000	1080	1160	1240	1320	1400	1400
625	460	540	725	835	930	1015	1095	1175	1255	1335	1415	1415
650	465	545	740	850	945	1030	1110	1190	1270	1350	1430	1430
675	470	550	755	865	960	1045	1125	1205	1285	1365	1445	1445
700	475	555	770	880	975	1060	1140	1220	1300	1380	1460	1460
725	480	560	785	895	990	1075	1155	1235	1315	1395	1475	1475
750	485	565	800	910	1005	1090	1170	1250	1330	1410	1490	1490
775	490	570	815	925	1020	1105	1185	1265	1345	1425	1505	1505
800	495	575	830	940	1035	1120	1200	1280	1360	1440	1520	1520

1. Flowers (cut flowers or floral pieces in cartons) regular express rate plus a surcharge of eighty-five (85¢) for each shipment.

2. Collect Shipments will be subject to a forty cent (40¢) service charge.

3. All Lot Shipments will be limited to five (5) pieces on any one bill of lading.

4. Except as provided below, no single package shall be accepted that is over twenty-four (24) inches in height, forty (40) inches in width or eighty-four (84) inches in length. The weight of any articles must not exceed one hundred and fifty (150) pounds.

Exception: Shipments of commodities listed below will be accepted with articles in excess of the limitations as to size (but not weight) specified above but shall be subject to a charge of two (2) times the regulation rate for such shipments as set out in Schedule A-2:

- (a) Automobile tires, bumpers, doors, exhaust pipes, fenders, grills, mufflers (when attached to exhaust pipes), panels, tail pipes (exhaust);
- (b) Glass products such as windshields, glass panes and television picture tubes.

5. Value Limitations

No single shipment shall be accepted exceeding five hundred (\$500.00) dollars in declared value.

Effective Date: June 1, 1983

All rates and charges are increases.

EXPRESS TRANSPORT ASSOCIATION

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Appendix VII-d

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Cancels

8th Revised Page 788

E.T.A. TARIFF 100

CTC (ET) 4713

SECTION 5

TABLE B — BETWEEN POINTS IN WESTERN CANADA — FOR APPLICATION SEE ITEM 600

TABLE B — BETWEEN POINTS IN WESTERN CANADA — FOR APPLICATION SEE ITEM 600												
TABLE OF SHIPMENT CHARGES												
Minimum Weight in Lbs.												
RATE BASES	RATES											
	500	1,000	2,000	5,000	10,000							
Notes in cents per 100 lbs.												
100	105	110	115	120	125	130	135	140	145	150	155	160
100	1000	1009	1018	1027	1036	1045	1054	1063	1072	1081	1090	1099
105	1010	1019	1028	1037	1046	1055	1064	1073	1082	1091	1100	1109
110	1020	1029	1038	1047	1056	1065	1074	1083	1092	1101	1110	1119
115	1030	1039	1048	1057	1066	1075	1084	1093	1102	1111	1120	1129
120	1040	1049	1058	1067	1076	1085	1094	1103	1112	1121	1130	1139
125	1050	1059	1068	1077	1086	1095	1104	1113	1122	1131	1140	1149
130	1060	1069	1078	1087	1096	1105	1114	1123	1132	1141	1150	1159
135	1070	1079	1088	1097	1106	1115	1124	1133	1142	1151	1160	1169
140	1080	1089	1098	1107	1116	1125	1134	1143	1152	1161	1170	1179
145	1090	1099	1108	1117	1126	1135	1144	1153	1162	1171	1180	1189
150	1100	1109	1118	1127	1136	1145	1154	1163	1172	1181	1190	1199
155	1110	1119	1128	1137	1146	1155	1164	1173	1182	1191	1200	1209
160	1120	1129	1138	1147	1156	1165	1174	1183	1192	1201	1210	1219
165	1130	1139	1148	1157	1166	1175	1184	1193	1202	1211	1220	1229
170	1140	1149	1158	1167	1176	1185	1194	1203	1212	1221	1230	1239
175	1150	1159	1168	1177	1186	1195	1204	1213	1222	1231	1240	1249
180	1160	1169	1178	1187	1196	1205	1214	1223	1232	1241	1250	1259
185	1170	1179	1188	1197	1206	1215	1224	1233	1242	1251	1260	1269
190	1180	1189	1198	1207	1216	1225	1234	1243	1252	1261	1270	1279
195	1190	1199	1208	1217	1226	1235	1244	1253	1262	1271	1280	1289
200	1200	1209	1218	1227	1236	1245	1254	1263	1272	1281	1290	1299
205	1210	1219	1228	1237	1246	1255	1264	1273	1282	1291	1300	1309
210	1220	1229	1238	1247	1256	1265	1274	1283	1292	1301	1310	1319
215	1230	1239	1248	1257	1266	1275	1284	1293	1302	1311	1320	1329
220	1240	1249	1258	1267	1276	1285	1294	1303	1312	1321	1330	1339

TABLE OF SHIPMENT CHARGES												
Minimum Weight in Lbs.												
RATE BASES	RATES											
	500	1,000	2,000	5,000	10,000							
Notes in cents per 100 lbs.												
100	105	110	115	120	125	130	135	140	145	150	155	160
100	1000	1009	1018	1027	1036	1045	1054	1063	1072	1081	1090	1099
105	1010	1019	1028	1037	1046	1055	1064	1073	1082	1091	1100	1109
110	1020	1029	1038	1047	1056	1065	1074	1083	1092	1101	1110	1119
115	1030	1039	1048	1057	1066	1075	1084	1093	1102	1111	1120	1129
120	1040	1049	1058	1067	1076	1085	1094	1103	1112	1121	1130	1139
125	1050	1059	1068	1077	1086	1095	1104	1113	1122	1131	1140	1149
130	1060	1069	1078	1087	1096	1105	1114	1123	1132	1141	1150	1159
135	1070	1079	1088	1097	1106	1115	1124	1133	1142	1151	1160	1169
140	1080	1089	1098	1107	1116	1125	1134	1143	1152	1161	1170	1179
145	1090	1099	1108	1117	1126	1135	1144	1153	1162	1171	1180	1189
150	1100	1109	1118	1127	1136	1145	1154	1163	1172	1181	1190	1199
155	1110	1119	1128	1137	1146	1155	1164	1173	1182	1191	1200	1209
160	1120	1129	1138	1147	1156	1165	1174	1183	1192	1201	1210	1219
165	1130	1139	1148	1157	1166	1175	1184	1193	1202	1211	1220	1229
170	1140	1149	1158	1167	1176	1185	1194	1203	1212	1221	1230	1239
175	1150	1159	1168	1177	1186	1195	1204	1213	1222	1231	1240	1249
180	1160	1169	1178	1187	1196	1205	1214	1223	1232	1241	1250	1259
185	1170	1179	1188	1197	1206	1215	1224	1233	1242	1251	1260	1269
190	1180	1189	1198	1207	1216	1225	1234	1243	1252	1261	1270	1279
195	1190	1199	1208	1217	1226	1235	1244	1253	1262	1271	1280	1289
200	1200	1209	1218	1227	1236	1245	1254	1263	1272	1281	1290	1299
205	1210	1219	1228	1237	1246	1255	1264	1273	1282	1291	1300	1309
210	1220	1229	1238	1247	1256	1265	1274	1283	1292	1301	1310	1319
215	1230	1239	1248	1257	1266	1275	1284	1293	1302	1311	1320	1329
220	1240	1249	1258	1267	1276	1285	1294	1303	1312	1321	1330	1339

TABLE OF SHIPMENT CHARGES												
Minimum Weight in Lbs.												
RATE BASES	RATES											
	500	1,000	2,000	5,000	10,000							
Notes in cents per 100 lbs.												
100	105	110	115	120	125	130	135	140	145	150	155	160
100	1000	1009	1018	1027	1036	1045	1054	1063	1072	1081	1090	1099
105	1010	1019	1028	1037	1046	1055	1064	1073	1082	1091	1100	1109
110	1020	1029	1038	1047	1056	1065	1074	1083	1092	1101	1110	1119
115	1030	1039	1048	1057	1066	1075	1084	1093	1102	1111	1120	1129
120	1040	1049	1058	1067	1076	1085	1094	1103	1112	1121	1130	1139
125	1050	1059	1068	1077	1086	1095	1104	1113	1122	1131	1140	1149
130	1060	1069	1078	1087	1096	1105	1114	1123	1132	1141	1150	1159
135	1070	1079	1088	1097	1106	1115	1124	1133	1142	1151	1160	1169
140	1080	1089	1098	1107	1116	1125	1134	1143	1152	1161	1170	1179
145	1090	1099	1108	1117	1126	1135	1144	1153	1162	1171	1180	1189
150	1100	1109	1118	1127	1136	1145	1154	1163	1172	1181	1190	1199
155	1110	1119	1128	1137	1146	1155	1164	1173	1182	1191	1200	1209
160	1120	1129	1138	1147	1156	1165	1174	1183	1192	1201	1210	1219
165	1130	1139	1148	1157	1166	1175	1184	1193	1202	1211	1220	1229
170	1140	1149	1158	1167	1176	1185	1194	1203	1212	1221	1230	1239
175	1150	1159	1168	1177	1186	1195	1204	1213	1222	1231	1240	1249
180	1160	1169	1178	1187	1196	1205	1214	1223	1232	1241	1250	1259
185	1170	1179	1188	1197	1206	1215	1224	1233	1242	1251	1260	1269
190	1180	1189	1198	1207	1216	1225	1234	1243	1252	1261	1270	1279
195	1190	1199	1208	1217	1226	1235	1244	1253	1262	1271	1280	1289
200	1200	1209	1218	1227	1236	1245	1254	1263	1272	1281	1290	1299
205	1210	1219	1228	1237	1246	1255	1264	1273	1282	1291	1300	1309
210	1220	1229	1238	1247	1256	1265	1274	1283	1292	1301	1310	1319
215	1230	1239	1248	1257	1266	1275	1284	1293	1302	1311	1320	1329
220	1240	1249	1258	1267	1276	1285	1294	1303	1312	1321	1330	1339

TABLE OF SHIPMENT CHARGES												
Minimum Weight in Lbs.												
RATE BASES	RATES											
	500	1,000	2,000	5,000	10,000							
Notes in cents per 100 lbs.												
100	105	110	115	120	125	130	135	140	145	150	155	160
100	1000	1009	1018	1027	1036	1045	1054	1063	1072	1081	1090	1099
105	1010	1019	1028	1037	1046	1055	1064	1073	1082	1091	1100	1109
110	1020	1029	1038	1047	1056	1065	1074	1083	1092	1101	1110	1119
115	1030	1039	1048	1057	1066	1075	1084	1093	1102	1111	1120	1129
120	1040	1049	1058	1067	1076	1085	1094	1103	1112	1121	1130	1139
125	1050	1059	1068	1077	1086	1095	1104	1113	1122	1131	1140	1149
130	1060	1069	1078	1087	1096	1105	1114	1123	1132	1141	1150	1159
135	1070	1079	1088	1097	1106	1115	1124	1133	1142	1151	1160	1169
140	1080	1089	1098	1107	1116	1125	1134	1143	1152	1161	1170	1179
145	1090	1099	1108	1117	1126	1135	1144	1153	1162	1171	1180	1189
150	1100	1109	1118	1127	1136	1145	1154	1163	1172	1181	1190	1199
155	1110	1119	1128	1137	1146	1155	1164	1173	1182	1191	1200	1209
160	1120	1129	1138	1147	1156	1165	1174	1183	1192	1201	1210	1219
165	1130	1139	1148	1157	1166	1175	1184	1193	1202	1211	1220	1229
170	1140	1149	1158	1167	1176	1185	1194	1203	1212	1221	1230	1239
175	1150	1159	1168	1177	1186	1195	1204	1213	1222	1231	1240	1249
180	1160	1169	1178	1187	1196	1205	1214	1223	1232	1241	1250	1259
185	1170	1179	1188	1197	1206	1215	1224	1233	1242	1251	1260	1269
190	1180	1189	1198	1207	1216	1225	1234	1243	1252	1261	1270	1279
195	1190	1199	1208									

WESTERN CANADA POINTS — TABLE B

*Minimum Charge: See Rule 87.
Applies to Canadian National only. Rates and charges include Fuel Surcharge.

All rates and charges are increases.

ISSUED OCTOBER 29, 1982

EFFECTIVE DECEMBER 1, 1982

By G. A. Shaw, Manager, Express Transport Association, Montreal, Que.

MANITOBA 1982/83 SHIP-BY-TRUCK
 DIRECTORY REVISED TARIFFS.

Effective Date: Dec. 6/82

SCHEDULE "E-9"
 of Board Order No. 17/82

Appendix VII-e

CHARGES PER SHIPMENT - IN CENTS PER SHIPMENT

Miles	T O T A L					S H I P M E N T					W E I G H T				
	1- 50	51- 100	101- 150	151- 200	201- 250	251- 300	301- 350	351- 400	401- 450	451- 500					
20	875	975	1050	1125	1200	1275	1350	1400	1475	1525					
30	900	1000	1075	1175	1250	1325	1400	1475	1550	1600					
40	925	1025	1125	1200	1300	1375	1450	1525	1600	1675					
50	925	1050	1150	1250	1325	1425	1500	1600	1675	1750					
60	950	1075	1175	1275	1375	1475	1550	1650	1750	1825					
70	975	1100	1200	1300	1425	1525	1625	1700	1800	1900					
80	975	1125	1225	1350	1450	1575	1675	1775	1875	1975					
90	1000	1125	1250	1375	1500	1600	1725	1825	1950	2050					
100	1025	1150	1300	1425	1550	1650	1775	1900	2000	2125					
110	1025	1175	1325	1450	1575	1700	1825	1950	2075	2200					
120	1050	1200	1350	1500	1625	1750	1875	2000	2125	2250					
130	1075	1225	1375	1525	1675	1800	1950	2075	2200	2325					
140	1075	1250	1400	1550	1700	1850	2000	2125	2275	2400					
150	1100	1275	1450	1600	1750	1900	2050	2200	2325	2475					
160	1125	1300	1475	1625	1800	1950	2100	2250	2400	2550					
170	1150	1325	1500	1675	1825	2000	2150	2325	2475	2625					
180	1150	1350	1525	1700	1875	2050	2200	2375	2525	2700					
190	1175	1375	1550	1750	1925	2100	2275	2425	2600	2775					
200	1200	1400	1600	1775	1950	2150	2325	2500	2675	2850					
210	1200	1425	1625	1800	2000	2200	2375	2550	2725	2900					
220	1225	1450	1650	1850	2050	2225	2425	2625	2800	2975					
230	1250	1475	1675	1875	2075	2275	2475	2675	2875	3050					
240	1250	1475	1700	1925	2125	2325	2525	2725	2925	3125					
250	1275	1500	1725	1950	2175	2375	2600	2800	3000	3200					
260	1300	1525	1775	2000	2200	2425	2650	2850	3075	3275					
270	1300	1550	1800	2025	2250	2475	2700	2925	3125	3350					
280	1325	1575	1825	2050	2300	2525	2750	2975	3200	3425					
290	1350	1600	1850	2100	2325	2575	2800	3025	3275	3500					
300	1350	1625	1875	2125	2375	2625	2850	3100	3325	3550					
310	1375	1650	1925	2175	2425	2675	2925	3150	3400	3625					
320	1400	1675	1950	2200	2475	2725	2975	3225	3450	3700					
330	1425	1700	1975	2250	2500	2775	3025	3275	3525	3775					
340	1425	1725	2000	2275	2550	2825	3075	3325	3600	3850					
350	1450	1750	2025	2300	2600	2850	3125	3400	3650	3925					
360	1475	1775	2050	2350	2625	2900	3175	3450	3725	4000					
370	1475	1800	2100	2375	2675	2950	3250	3525	3800	4075					
380	1500	1825	2125	2425	2725	3000	3300	3575	3850	4150					
390	1525	1850	2150	2450	2750	3050	3350	3625	3925	4200					

POOR

QUALITY

ORIGINAL